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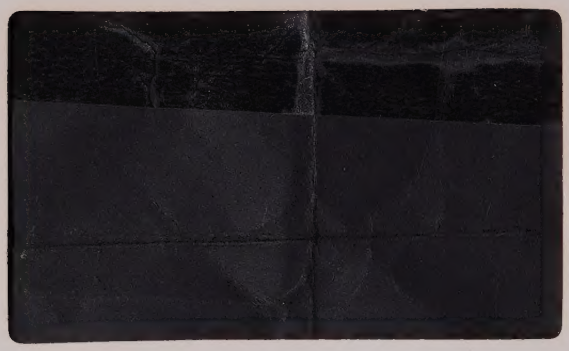

SERIES 2000
DIGITAL MICROVOLTMETER
MODEL 2400

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03078

SERIES 2000 DIGITAL MICROVOLTMETER MODEL 2400

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CERTIFICATION

Newport Laboratories, Inc., certifies that this (these) instrument(s) was (were) thoroughly inspected and tested at the factory prior to shipment and found to meet all requirements defined by the contract under which they are furnished.

WARRANTY AND ASSISTANCE

All products of Newport Laboratories, Inc., are warranted against defective material and workmanship for a period of one year from the date of delivery. Newport Laboratories will repair or replace all defective equipment returned to it (transportation charges prepaid) during the warranty period, without charge provided there is no evidence that the equipment has been mishandled or abused. This warranty does not apply to expendable parts or materials whose normal life is less than the warranty period, nor is Newport Laboratories liable for consequential damages arising out of the use or handling of its products.

In all orders for service, please include the model and serial number and the name of the original purchaser of the equipment.

DESCRIPTION

Model 2400 provides digital readout from transducers, with microvolt sensitivity. It employs chopper-stabilized (solid-state) input to reduce instability on account of temperature and aging to a negligible level. A choice of multi-pole, active filters assures flicker-free readings despite noisy environment. An optional, highly-stable excitation supply is available in the same package to complete the electronics requirement for transducers in DC bridge circuits.

Model 2400 shares the high-quality family characteristics of the Series 2000 Digital Panel Meter. These include rugged construction, double shielding and high rejection of input common-mode voltage with respect to digital ground as well as AC power ground.

MICROVOLTMETER SPECIFICATIONS

Full Scale	±19.999 millivolts (2-to-1 variation is achievable by adding an external resistor. Specify option FS1 for other ranges)
Input Impedance	1000 megohms minimum
Maximum Overdrive	±25 volts
Total Error, 8 hrs. at 25°C	.01%R ±.01%FS
Total Error, 15-35°C, 30 days	.02%R ±.01%FS ±2uV
Reading Rates	4,20 or 30 readings/sec, internal control Up to 20 readings/sec, external control
Settling Time	After full-scale step input, to within .01%: 600 milliseconds
Bias Current	100 pa typical
Source Impedance	Maximum recommended, 10,000 ohms Consult factory for higher source resistances
CMR, DC to 60 Hz	CMR ratio to digital ground: 120 db with 300v isolation CMR ratio to power ground: 120 db with 300v isolation
NMR	80 db at 60 Hz
Operating Environment	Temperature: 0°C to + 60°C Relative Humidity: 0 to 90% Humidity-sealed boards available on request.
Weight	5.5 pounds, net; 10 pounds, shipping
Power	115/230 VAC, 50-400 Hz, 9 watts. see option C2 for DC power.
Size	3.7" high x 5.2" wide x 7.5" deep

TRANSDUCER EXCITATION-SUPPLY (OPTIONAL)

Regulation Mode	constant voltage, remote sensing
V-Constant Output	10 or 15 volts, with ±5% adjustment potentiometer, up to 100 ma load
Stability	±0.005%, 8 hrs. at 25°C ±0.015%, 30 days at 15 to 35°C
Ripple, Peak-to-Peak	less than 0.01% of output
Protection	immune to short circuit
Isolation from Power Input and Voltmeter	300V maximum
Power Input	115V or 230V RMS ±10%, 50 to 400 Hz, one watt plus output load
Zero Control	±5% of full scale signal input to voltmeter

FILTER CHARACTERISTICS

	fast AF6	standard AF7	high-rejection AF8
NMR at 60 Hz	60 db	>80 db	> 80 db
NMR at 20 Hz		20 db	70 db
NMR at 5 Hz		6 db	30 db
Settling Time	300 ms	600 ms	3000 ms

BCD ELECTRICAL OUTPUT AND CONTROL

All inputs/outputs are compatible with T^2L and DTL logic.

EXTERNAL CONTROL

Measurements may be controlled externally by either a positive-true Measurement Enable signal or a negative-true Measurement Enable signal. While the control input is maintained true, measurements occur at a selected rate of 4, 20 or 30 readings per second. (Other reading rates may be obtained by use of an external resistor.) The control signal must meet the following requirements:

Levels	Measurement Enable	$\overline{\text{Measurement Enable}}$
+2.5v to +6v (1ma source)	True	False
-1v to +0.5v (1ma sink)	False	True

STROBE TRANSFER OUTPUT

The Strobe Transfer output goes true for 10us at the time a new reading is being transferred into the BCD output storage-register. Signal characteristics are:

True:	greater than +4.0v	7K source resistance
False:	0v to +0.6v	3ma current sink

DIGITAL OUTPUTS

The stored and buffered BCD outputs include the Overrange and Polarity bits, as well as the magnitude of the reading. Signal characteristics are:

True:	greater than +3.0v	4K source resistance
False:	0v to +0.6v	3ma current sink

Options	Description
A4	Mounts case on studs behind front panel
A5	Mounts case by screws through front panel
A6	Mounts case with decorative bezel
AF6	Active Filter, 60 db at 60 Hz, 300 ms settling
AF7	Active Filter, 20 db at 20 Hz, 600 ms settling
AF8	Active Filter, 70 db at 20 Hz, 3000 ms settling
C1	Operation on 230 volts power, 50 to 400 Hz
C2	External Inverter for 12 VDC Operation
D3	Three P.C. edge connectors with solder terminals
FS1	Special Full Scale, ±10.000mv to ±100.00mv; specify with order or determine by adding an external resistor.
TS1	Transducer Excitation Supply, constant voltage, 10 volts
TS2	Transducer Excitation Supply, constant voltage, 15 volts

OPERATION AND CONNECTION

2400 SERIES DIGITAL PANEL METER

INPUT POWER

The standard power requirement is 115 VAC, ±10% 50-400 Hz. Connection is made through a standard 3-wire hookup, 2 conductors for AC power and the third for grounding the meter case. Connect the power ground to J1, Pin P (PWR GND). The power ground is connected to the case through a ground strap and solder lug on a back panel screw wired to PWR GND. The "HOT" side of the AC line should connect to J1, Pin M (AC HI) and the "COLD" side of the AC line to J1, Pin N (AC LO).

ANALOG INPUTS

The voltage to be measured is connected between SIG LOW, J3, Pin 7 and SIG INPUT, J3, Pin 8.

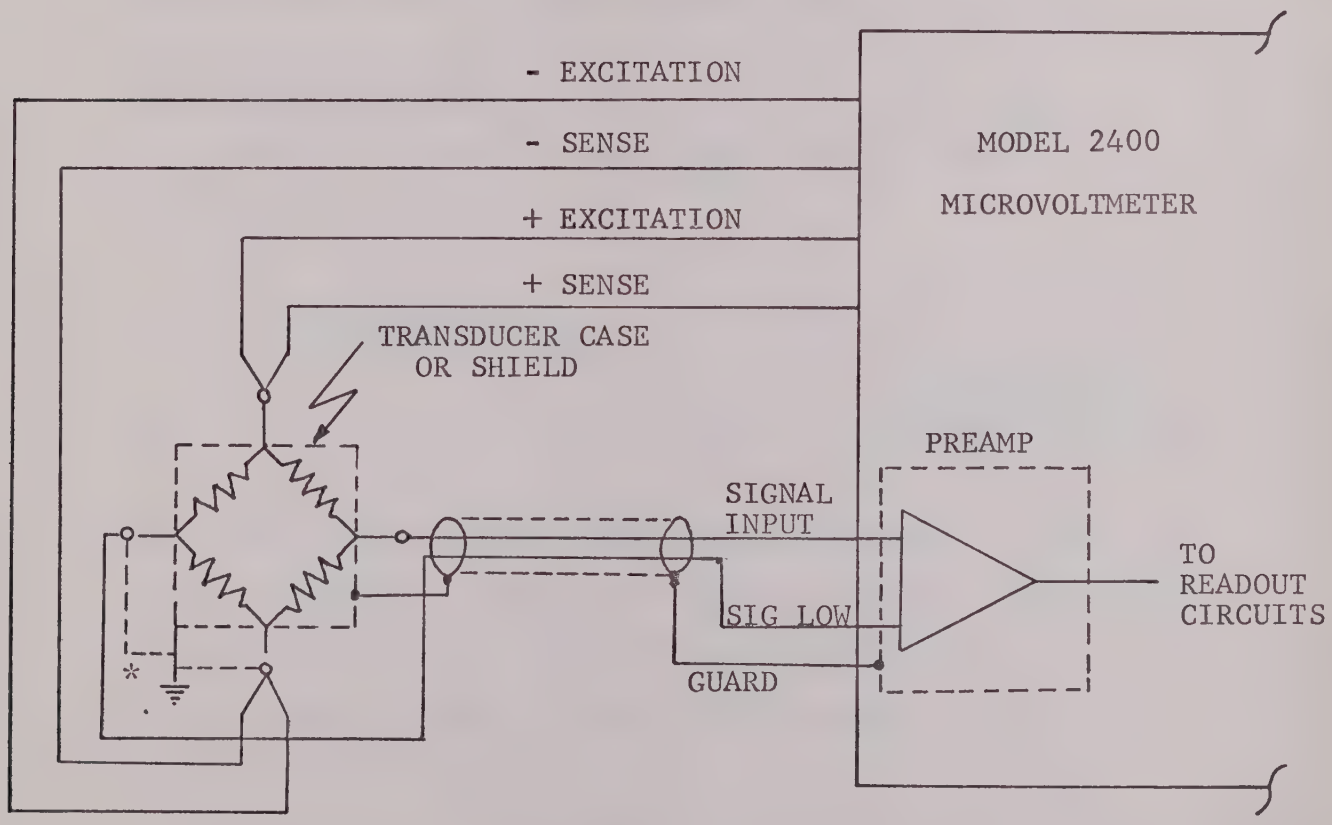
SIG INPUT should be connected to the highest impedance point, SIG LOW to the lower impedance point and GUARD, J3, Pin 3, to a low impedance point of approximately the same voltage as SIG LOW. For most measurements, the GUARD should be connected to SIG LOW except for situations where differential inputs off ground are required (such as a transducer bridge).

To minimize error due to thermally generated offsets, use copper or gold plated wire connectors and clips.

TRANSDUCER/EXCITATION CONNECTION

The internal transducer power supply (Option TS-1, TS-2) can be used to supply isolated power to excite a transducer bridge such as a strain guage (refer to Drawing 02169 for wiring instructions for input power and output connections). An external power supply with .01% stability can be used in place of the internal power supply.

The sense lines can be connected to the excitation lines at the connector pins if the excitation wiring is short. For use over longer distances or where a load resistance may be changing, use separate lines for the sense inputs.



* NOTE: IN SOME SYSTEMS, LOWER READOUT NOISE MAY BE OBTAINED BY CONNECTING ONE BUT NOT BOTH OF THE DOTTED LINES TO CASE OR SHIELD GND.

FIGURE 1. TRANSDUCER CONNECTION TO MICROVOLTMETER

The excitation and sense wiring should be as heavy as is practical.

Figure 1. illustrates a typical hook-up of a transducer. If possible, connect either the SIG. LOW or one of the excitation lines to ground and connect the GUARD and transducer case to ground.

READ RATE ENABLE

The read rate for 2400 is normally operated at 4 readings/sec. To enable 4 readings/sec. connect J1, Pin X to J1, Pin T. To enable by external command or other reading rates refer to Read Enable Information.

FS-1 RANGE SELECTION

Select the value of the range resistor from the following formula:

$$R = \frac{(.4219)\ FS}{21 - FS\ (.02009)}$$

R - is in KILOHMS

FS - is the required full scale value in MILLIVOLTS for a readout of 20000.

The resistor should be $\pm$.1%, 10PPM, wirewound in order to insure calibration with the internal full scale adjustment. Connect the resistor between J2, Pin 8 and J2, Pin 10. Refer to NON-STANDARD RANGE CALIBRATION for calibration procedure.

RANGE CHANGING

SERIES 2000 DIGITAL MICROVOLTMETER

MODEL 2400

The utility of the Series 2000 is expanded by the capability of changing its full scale range for applications requiring non-standard ranges. Ranging accuracy is a function of the quality of external components, lead lengths, contact resistance and mounting techniques. Guaranteed accuracy is for factory-adjusted range only.

NON STANDARD RANGES

In applications requiring a range change for a non-standard full scale, one of the following methods can be employed for a full scale range of between 10 and 20mV. For other full scale ranges option FS1 must be ordered.

METHOD 1

To change the range from 20mV to 10mV FS, use an external resistor across J2, Pin 8 & Pin 10. The value of the resistor is 2.041K, .1%. For other full scale sensitivities between 10mV and 20mV use the formula:

$$R = \frac{FS\ (2.041)}{20 - FS}$$

R - is in KILOHMS

FS - is MILLIVOLTS for a reading of 20000.

METHOD 2

This method increases normal mode rejection and also increases settling time by a factor of 2. To change the range from 20mV to 10mV, insert a resistor in series with J2, Pin 10 & J3, Pin R and connect close as possible to J3, Pin R. The value of the resistor for 10mV full scale is 101K, .1%. The resistance for other full scale ranges between 10mV and 20mV can be found by the formula:

$$R = \frac{2020\text{-}101FS}{FS}$$

R - is in KILOHMS

FS - is in MILLIVOLTS for 20000 readout

HIGH-LEVEL RANGING

For range attenuator of X1, 10 and 100 see figure 2.

1. If no calibration pots are needed (basic attenuator resistors are equal to or greater than desired accuracy), omit R4, R4A, R5, R5A and use 90K for R1.
2. Shielding of attenuator should not be needed if care is taken to mount all resistors close together without power lines and transformers, etc. nearby. Also care should be taken to avoid leakage paths around high value resistors such as R1. The lower the attenuator resistance, the less critical is shielding.

ATTENUATOR

3 RANGE

CONSTANT IMPEDANCE

Figure 1

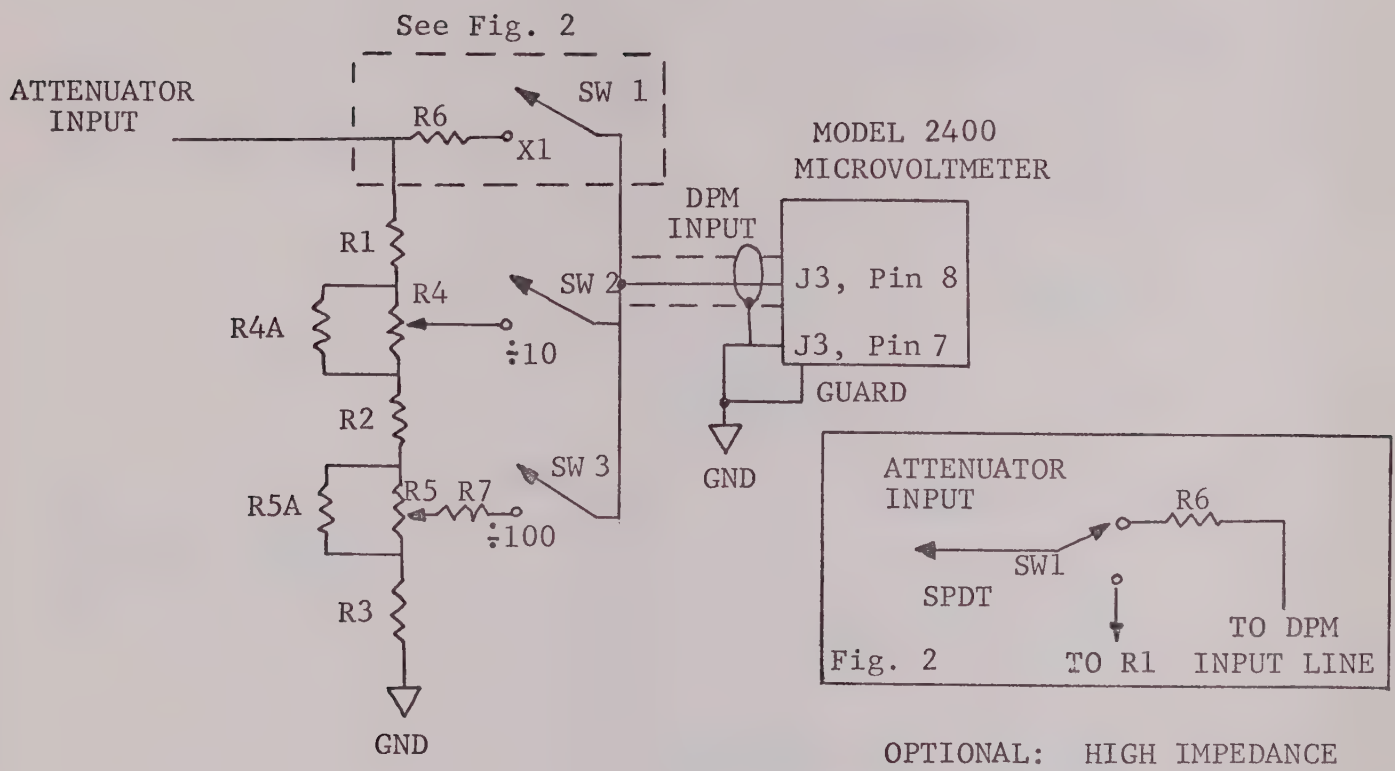


Fig. 2

OPTIONAL: HIGH IMPEDANCE ON LOWEST RANGE

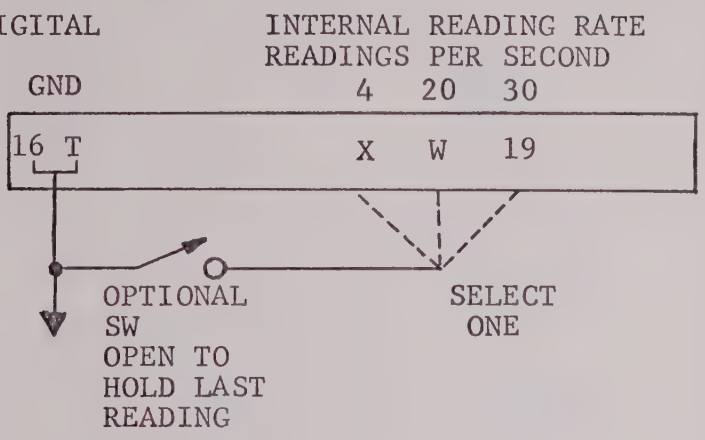
	TYPE RESISTOR	TOLERANCE	VALUES
R1	W/W	0.1%	90.320K Ohms
R2	W/W	0.1%	9.000K Ohms
R3	W/W	0.1%	1K Ohm
R4	Pot	20%	100 Ohms
R4A	Carbon	5%	4.2 Ohms
R5	Pot	20%	100 Ohms
R5A	Carbon	5%	56 Ohms
R6	Carbon	5%	9.1K Ohms
R7	Carbon	5%	8.2K Ohms

2000 SERIES READ ENABLE INFORMATION

MODE 1

INTERNAL CONTROL
FIXED READING RATE

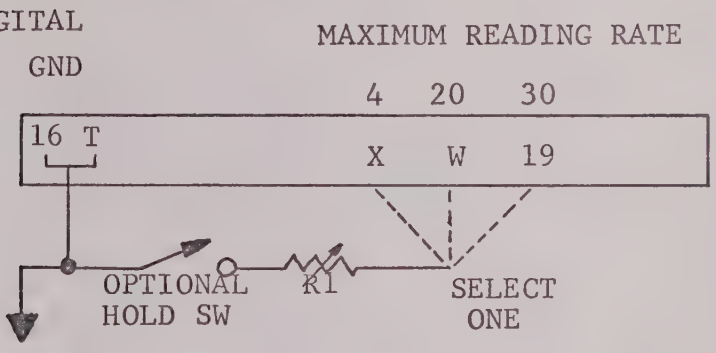
P1



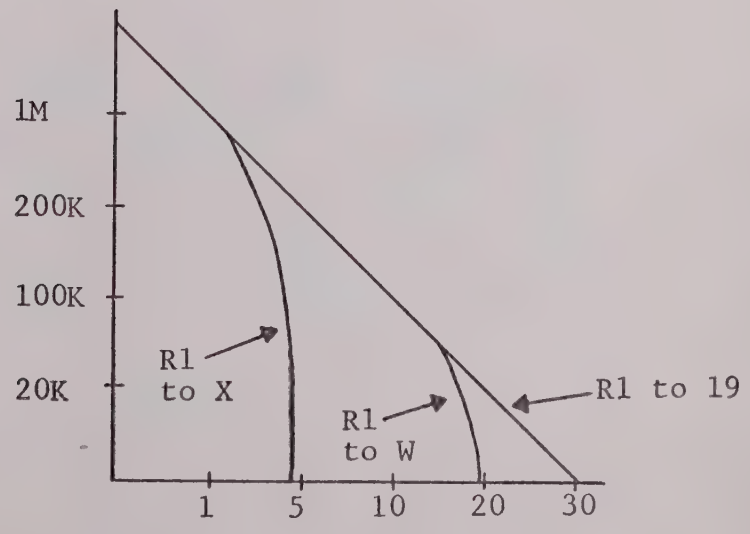
MODE 2

INTERNAL CONTROL
VARIABLE READING
RATE

P1



R1



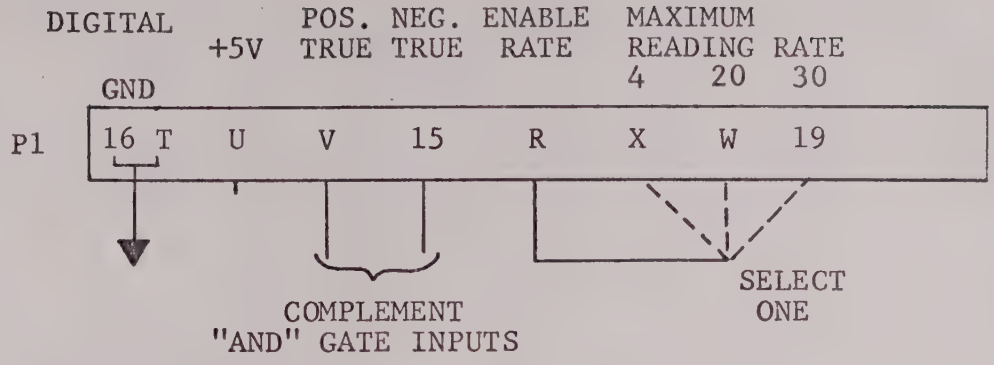
TYPICAL READING RATE

MEASUREMENT
ENABLES

MODE 3

EXTERNAL READ COMMAND

LEVEL CONTROL



Readings will occur at selected maximum reading rate while both inputs of the complement "AND" gate are true (V to U, 15 to 16). Last reading will be held if either input goes false.

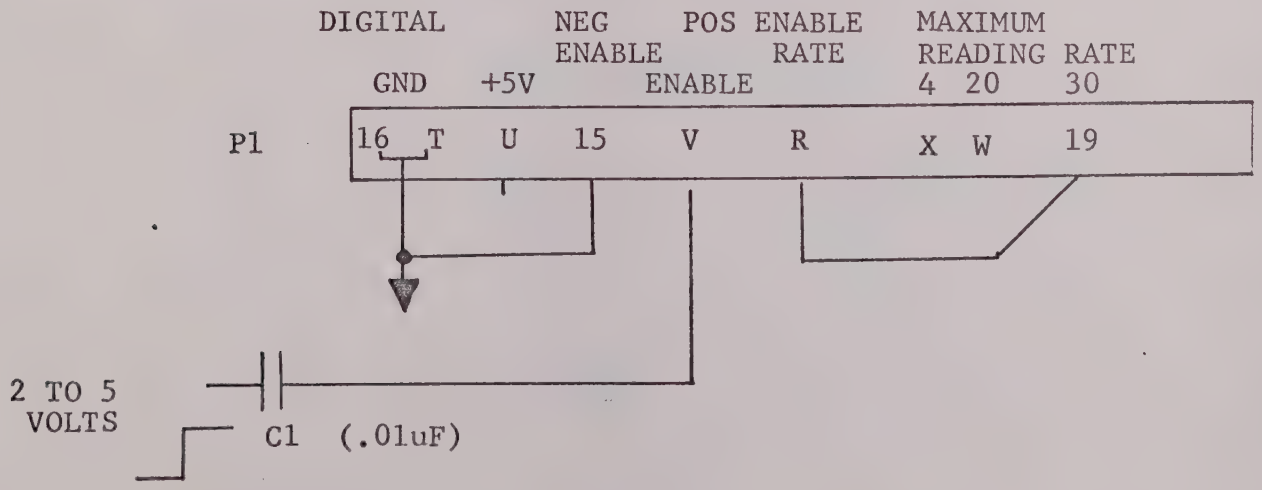
	PIN	TRUE	FALSE
POS TRUE ENABLE	V	2V into 5K Ohms	.5V
NEG TRUE ENABLE	15	.5V @ 1MA	2V

All voltages are with respect to digital GND Pin 16 or T.

MODE 4

EXTERNAL READ COMMAND

POSITIVE TRANSIENT CONTROL

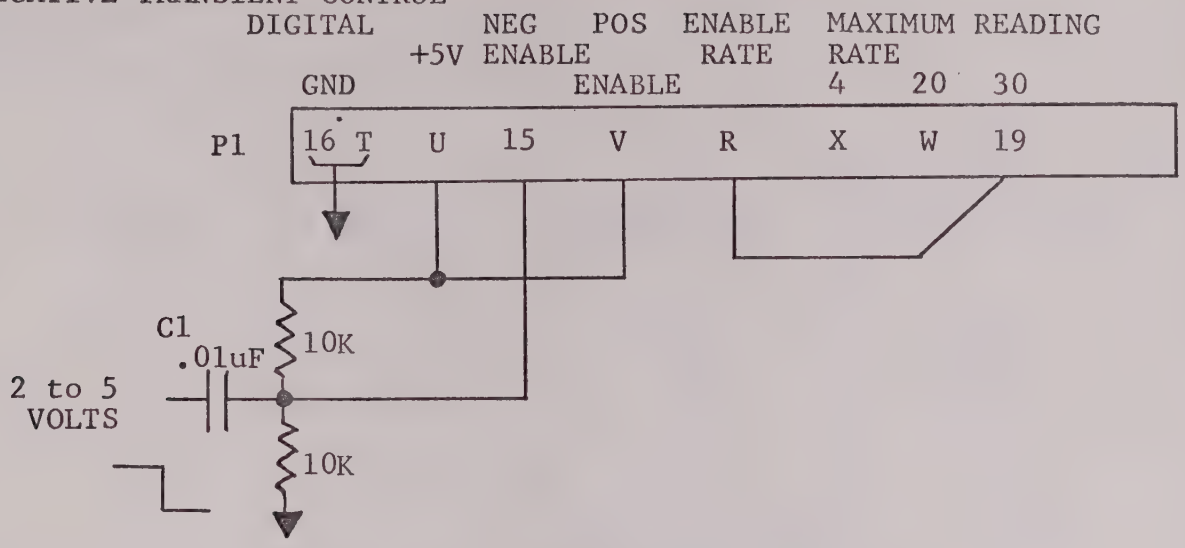


AC coupling for single reading-POSITIVE edge trigger.

MODE 5

EXTERNAL READ COMMAND

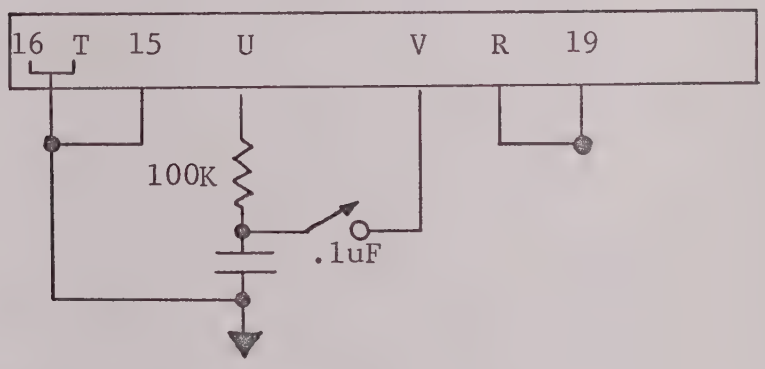
NEGATIVE TRANSIENT CONTROL



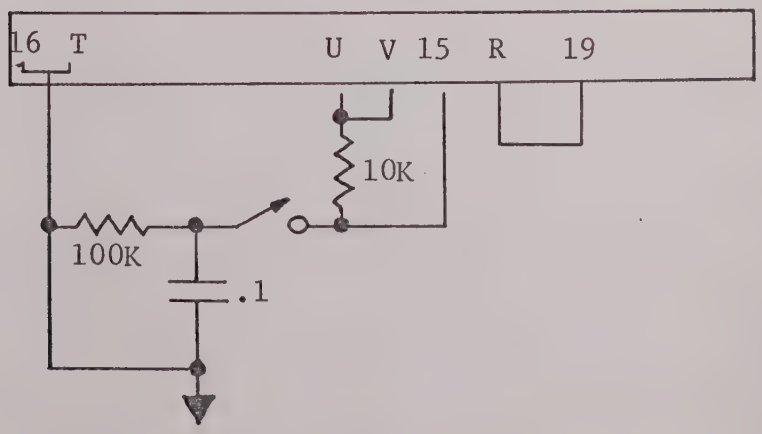
AC coupling for single reading NEGATIVE edge trigger.

MODE 6

Single reading command from push button (no bounce circuit)



USING POSITIVE ENABLE



USING NEGATIVE ENABLE

PULSE WIDTH

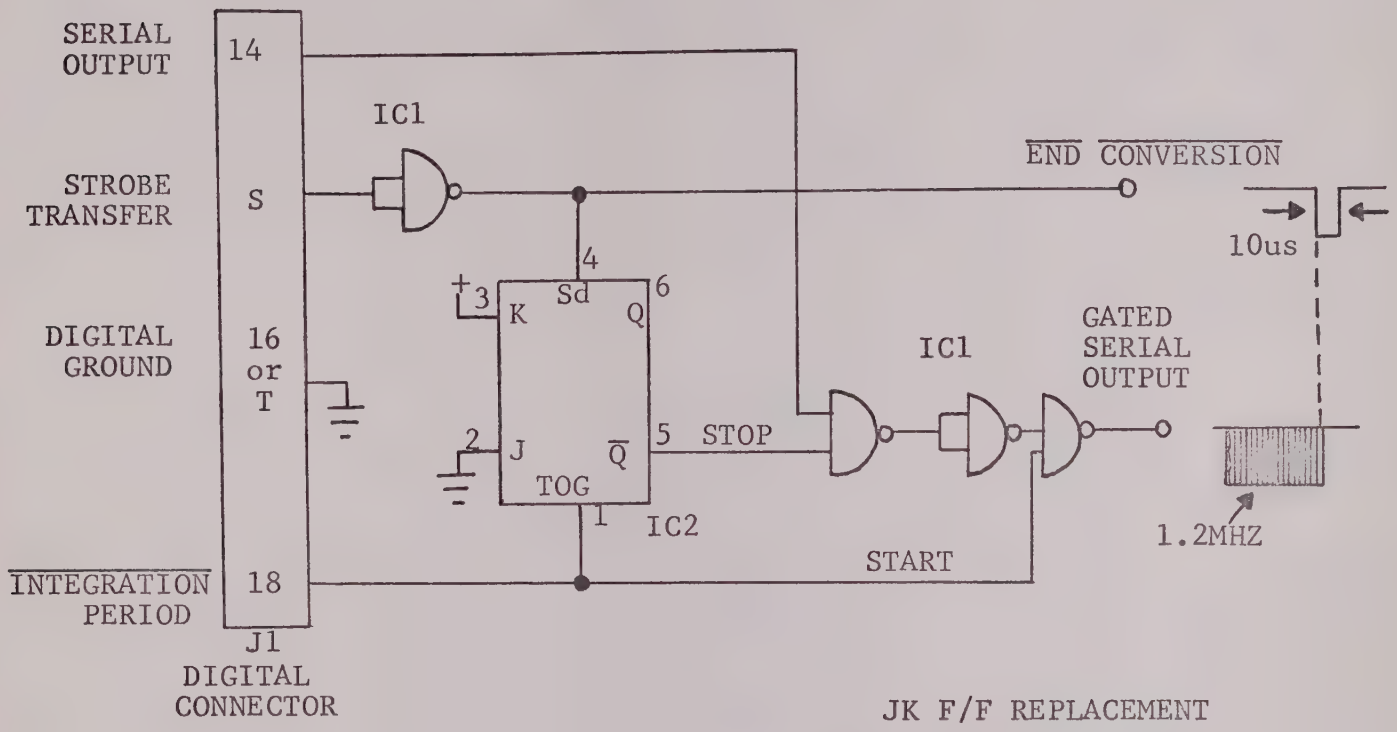
Requirements with external command

P1-R Connected To	MAXIMUM READING RATE	MINIMUM ENABLE PULSE WIDTH	MAXIMUM ENABLE PULSE FOR ONE READING
X	4/sec	100ms	200ms
W	20/sec	1ms	30ms
19	30/sec	10us (2us if .0015uF is added from Pin R to 16)	20ms

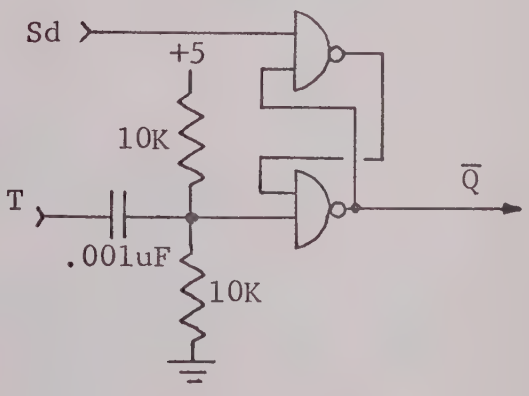
SERIAL OUTPUT CONVERSION

Application Note 102

A train of pulses equal to the number of counts per reading may be derived by adding external logic. Lead lengths between connector P1 and the logic should be less than 2 feet.



JK F/F REPLACEMENT



NOTES

1. Numbers on IC2 are pin numbers for a 15809 Dual JK F/F.
2. IC1 is a 946 DTL quadruple 2-input NAND gate or the equivalent.
3. Pulses out is equal to readout plus one count. Maximum pulses out is 20,000.

PIN ASSIGNMENTS

MODEL 2400

DIGITAL AND ANALOG

P1 DIGITAL BOARD UPPER SIDE

PIN	FUNCTION
1	D.P. 1XXX.X
2	1 bit
3	2 bit
4	4K bit
5	8K bit
6	40 bit
7	200 bit
8	400 bit
9	2K bit
10	OL bit
11	OPEN
12	OPEN
13	GND (case & power line)
14	SERIAL OUT
15	$\overline{\text{MEASUREMENT ENABLE}}$
16	GND (DIGITAL)
17	$\overline{\text{CONVERSION PERIOD}}$
18	$\overline{\text{INTEGRATION PERIOD}}$
19	30/SECOND ENABLE
20	NEG POLARITY bit
21	D.P. 1.XXXX
22	D.P. 1X.XXX

P1 DIGITAL BOARD LOWER SIDE

PIN	FUNCTION
A	D.P. 1XX.XX
B	4 bit
C	8 bit
D	20 bit
E	10 bit
F	80 bit
H	100 bit
J	800 bit
K	1K bit
L	10K bit
M	AC Line HI
N	AC Line LO
P	GND (case & power line)
R	MEASUREMENT ENABLE RATE
S	STROBE TRANSFER
T	GND (DIGITAL)
U	+5 VOLTS
V	MEASUREMENT ENABLE
W	20/SECOND ENABLE
X	4/SECOND ENABLE
Y	BUFFER OUT
Z	+250 VOLTS ($\frac{1}{2}$ wave)

P2 ANALOG BOARD EITHER SIDE

PIN	FUNCTION
1	GUARD
2	
3	-30 VOLTS
4	
5	
6	+30 VOLTS
7	
8	ANALOG GND
9	ANALOG GND
10	G_m Resistor
11	
12	PREAMP OUT
13	
14	EXT REF IN
15	GUARD

NOTE:

To initiate readings connect P1-W, P1-X or P1-19 to P1-16 or P1-T.

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PIN ASSIGNMENTS

MODEL 2400

PREAMPLIFIER

P3

PREAMP BOARD

UPPER SIDE

PIN	FUNCTION
1	Not Used
2	Not Used
3	Guard
4	+ Excitation
5	- Sense
6	Ext. Trim
7	Signal LOW
8	Signal Input
9	ANALOG GRND
10	Current Zero
11	Not Used
12	Not Used
13	+ 30V In
14	- 30V In
15	- COARSE TARE
16	COARSE TARE ADJ.
17.	- UNREG VOLTS
18	COARSE EXCITATION ADJ.
19	COARSE EXCITATION 1
20	+ UNREG VOLTS
21	Not Used
22	Not Used

P3

PREAMP BOARD

LOWER SIDE

PIN	FUNCTION
A	Not Used
B	Not Used
C	Guard
D	+ Sense
E	- Excitation
F	Preamp Out
H	Not Used
J	Not Used
K	Circuit GRND
L	Preamp Filter Out
M	Feedback 2
N	RTI Offset
P	RTO Offset
R	Feedback 1
S	Not Used
T	Not Used
U	+ COARSE TARE
V	UNREG VOLTS GND
W	COARSE EXCITATION 2
X	Power GND (Case)
Y	AC Line LO
Z	AC Line HI

CALIBRATION PROCEDURE

2400 SERIES DIGITAL PANEL METER

CAUTION

Due to the high input sensitivity of the microvoltmeter, extreme care must be exercised to avoid thermally generated offset voltages which can appear at any voltage divider contacts or other input connections to the microvoltmeter. To minimize these effects use copper wiring and connectors for input connections and keep input leads away from sources of heat.

The following equipment is recommended for calibration:

1. Variable Voltage Reference, accuracy .003% or greater, such as Fluke Model No. 343A or equivalent.
2. 100/1 Voltage Divider, accuracy .003% or greater, such as ESI Model No. RV662A or equivalent.

NOTE: A 100/1 Divider is necessary because most voltage references are not accurate to .01% with a 10 millivolt output due to internal offsets and noise. Do not attempt any of the calibration, except step A-1, without the divider, unless the variable reference source is especially made for .01% microvolt meters.

CURRENT ZERO ADJUSTMENT (R13) - FACTORY ADJUSTMENT PROCEDURE

(Not necessary under normal conditions)

Short the input terminals and record the reading. Connect a 1 megohm resistor across input terminals. The readout sould not change by more than 0100. If necessary adjust CURRENT ZERO ADJUSTMENT (R13) for minimum change. Remove resistor and then check calibration of the meter.

I. CALIBRATION PROCEDURE

A. ZERO

1. Short the input terminals and adjust PREAMP ZERO (R45)* for a readout of 0000 (or the minimum readout possible) and the polarity sign bouncing. If the minimum readout is not zero, adjust ZERO WIDTH (R21) until a readout of 0000 just appears.
2. If adequate equipment is available, use the following steps for the zero adjustment:
   a. Connect +10.5 microvolts to the input and note reading. Connect-10.5 microvolts to the input and verify readout is the same as the positive polarity. If they are not the same, adjust PREAMP ZERO* until the same readout is produced in both polarities.
   b. If the readout is not 0010, adjust ZERO WIDTH (R21) to obtain a readout of 0010.
   c. Verify zero by shorting input. If necessary, re-adjust PREAMP ZERO slightly to obtain readout of 0000.

B. FULL SCALE

1. Connect +15.000mV to the input and adjust +FS ADJ. (R26) for readout of 15000.
2. Connect -15.000mV to the input and check for readout of 15000 , ±1. Adjust -FS ADJ. (R20) if necessary.

II. METERS WITH NON-STANDARD FULL SCALE RANGES

A. ZERO

1. Short the input terminals and adjust PREAMP ZERO (R45)* for a readout of 0000 (or minimum readout possible) and bouncing polarity. If the minimum readout is not zero, adjust ZERO WIDTH until a readout of 0000 just appears.

B. FULL SCALE

1. Connect to the input a known reference voltage near the full scale value, and adjust +FS ADJ. (R26) for the required readout.
2. Reverse the polarity of the input reference voltage, if the meter is bipolar, and adjust -FS ADJ. (R20) for the required readout.

* NOTE: If tare adjustments are available, PREAMP ZERO should be centered and the coarse and fine tare adjustments should be used for coarse adjustment along with PREAMP ZERO as a fine control.

CALIBRATION PROCEDURE FOR TRANSDUCER BRIDGE INPUTS

A. TARE (ZERO) ADJ.

1. Center the FINE TARE ADJ.
2. Adjust the COARSE TARE ADJ. for approximately the readout required. (See drawing 02169 for wiring details).
3. Adjust the FINE TARE ADJ. for exactly the readout required.

B. EXCITATION (SPAN) ADJ. (Adjusts the voltage of the EXCITATION POWER SUPPLY)

1. If the FINE EXCITATION ADJ. does not have enough range to obtain the required voltage or readout use the COARSE EXCITATION ADJ. (See drawing 02169 for wiring details).
2. Apply a reference standard, near full scale, to the transducer or bridge.
3. Adjust the COARSE EXCITATION ADJ. for approximately the required voltage or readout.
4. Adjust the FINE EXCITATION ADJ. for exactly the voltage or readout required.

C. REPEAT STEPS A & B

(For large changes, tare and span adjustments of most transducers interact, requiring steps A and B repeated to insure calibration.)

ADJUSTMENT PROCEDURE WITH EXCITATION POWER SUPPLY

A. TARE (ZERO) ADJ.

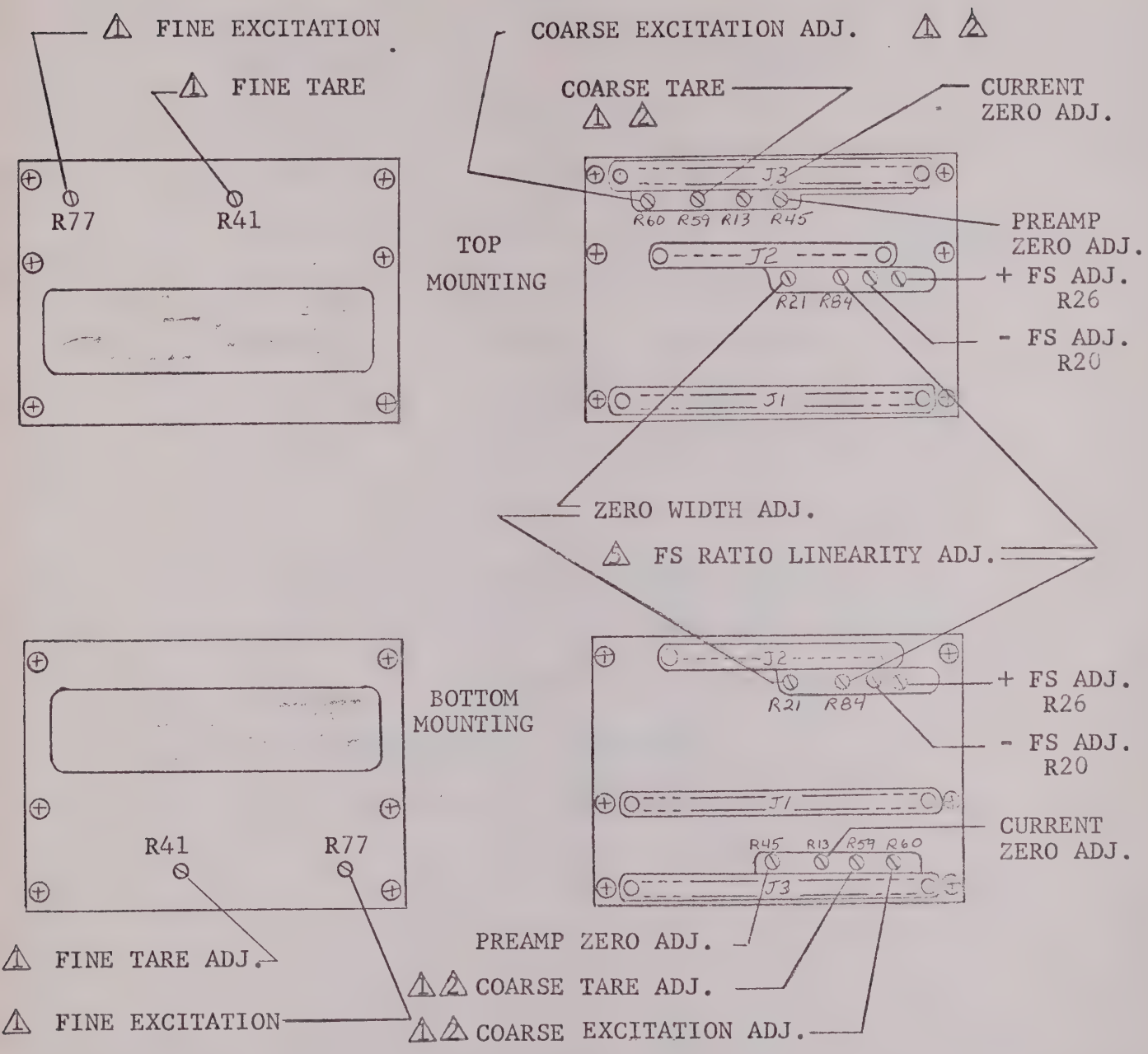
1. Center the FINE TARE ADJ.
2. If the required readout is greater than ±90 of the indicated readout, use the COARSE TARE ADJ. (See drawing 02169 for wiring details), if it is not proceed to step 4.
3. Adjust the COARSE TARE ADJ. for approximately the readout required.
4. Adjust the FINE TARE ADJ. for exactly the readout required.

B. SPAN ADJUSTMENT

1. Center the FINE EXCITATION ADJ. on the front panel.
2. Apply a reference standard, near full scale, to the transducer or sensor. If the readout required is different by more than ±90 of the reading use the COARSE EXCITATION ADJ. (See drawing 02169 for wiring details).
3. Adjust the COARSE EXCITATION ADJ. for approximately the required readout. Adjust the FINE EXCITATION ADJ. for exactly the readout required.

C. Repeat steps A and B. Tare and Span Adjustments interact and may require steps A and B repeated to ensure calibration.

LOCATION OF ADJUSTMENTS - MODEL 2400



NOTES:

⚠ NORMALLY INSTALLED WITH AN EXCITATION OPTION ONLY.

⚠ SEE DWG. 02169 FOR WIRING INSTRUCTIONS.

3 PREAMP ZERO ADJ. CAN BE USED AS A FINE TARE ADJ.

4 + FS ADJ. CAN BE USED AS A FINE SPAN ADJ.

⚠ INSTALLED WITH A RATIO OPTION ONLY. (FACTORY ADJ.)

03078

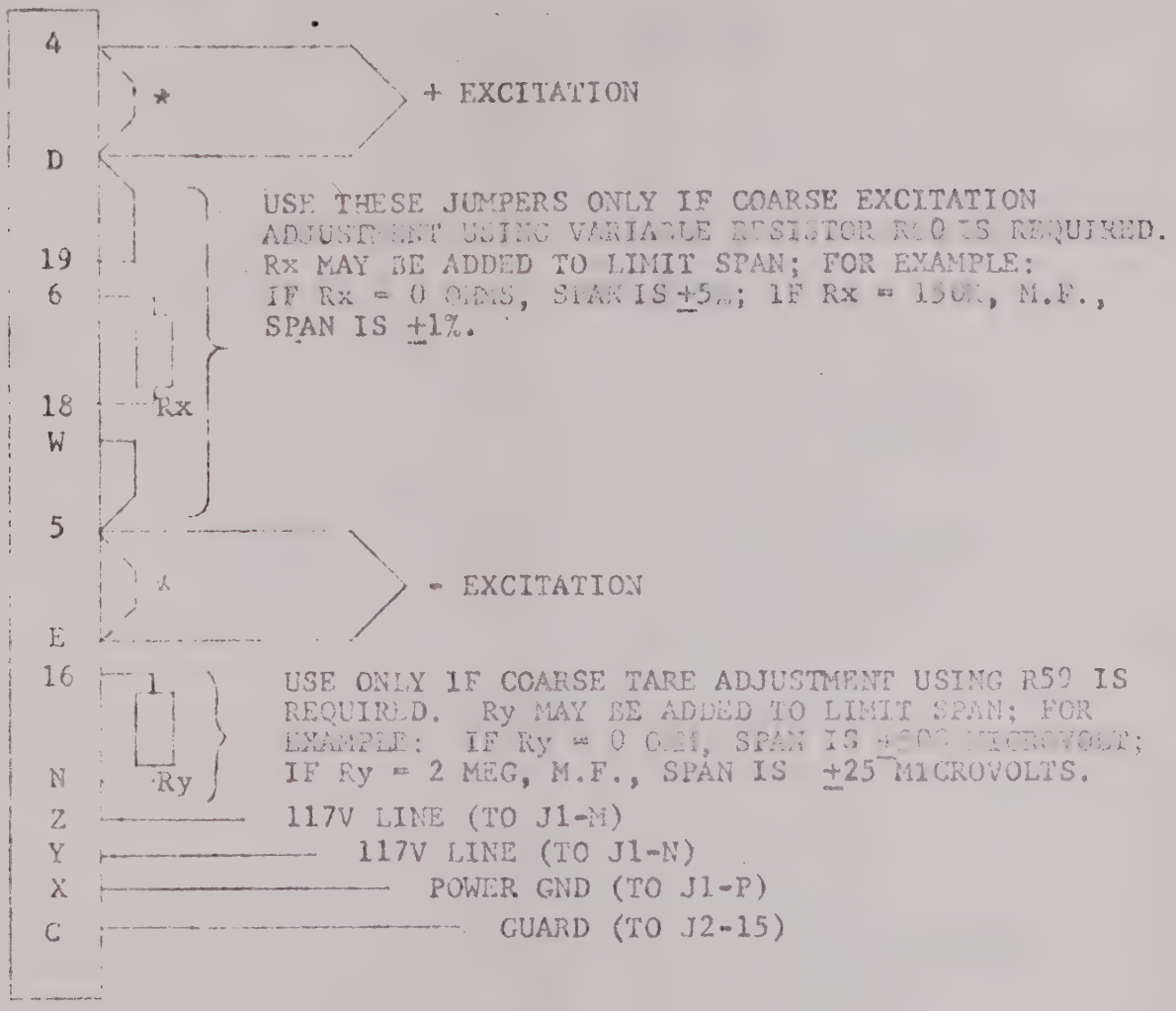
DRAWINGS

DRAWING NO.	TITLE
02867	Timing Diagram
02169	Excitation Wiring
02170-01	Connector Wiring (Bottom Mounting)
02170-02	Connector Wiring (Top Mounting)
02067-01	Schematic, Preamplifier
02067-02	Schematic, Excitation Power Supply
02066	Assembly Diagram, Preamplifier
01777	Schematic Diagram (Analog Board)
01776-02	Assembly Diagram (Analog)
01772	Schematic Diagram (Digital Board)
01771	Assembly Diagram (Digital)
Panel Cutout & Case Dimensions	
Returned Material Authorization	

CHG'D NO.	DATES	BY	

J3

PREAMP CONNECTOR


4
*
+ EXCITATION
D
USE THESE JUMPERS ONLY IF COARSE EXCITATION ADJUSTMENT USING VARIABLE RESISTOR R60 IS REQUIRED. Rx MAY BE ADDED TO LIMIT SPAN; FOR EXAMPLE: IF Rx = 0 OHMS, SPAN IS ±5%; IF Rx = 150K, M.F., SPAN IS ±1%.
19
6
18
Rx
W
5
*
- EXCITATION
E
16
1
N
Ry
USE ONLY IF COARSE TARE ADJUSTMENT USING R59 IS REQUIRED. Ry MAY BE ADDED TO LIMIT SPAN; FOR EXAMPLE: IF Ry = 0 OHM, SPAN IS ±500 MICROVOLTS; IF Ry = 2 MEG, M.F., SPAN IS ±25 MICROVOLTS.
Z
117V LINE (TO J1-M)
Y
117V LINE (TO J1-N)
X
POWER GND (TO J1-P)
C
GUARD (TO J2-15)

* PIN E MAY BE CONNECTED TO PIN 5 AND PIN 4 TO PIN D AT CONNECTOR J3 IF REMOTE SENSING IS NOT REQUIRED.

UNLESS OTHERWISE SPECIFIED	BY	DATE
	DR	
TOLERANCES .X ±.05 .XX ±.02 .XXX ±.005 ANGULAR ±0°30' ✓	CHK	
THREADS CLASS 2A OR 2B REMOVE BURRS AND SHARP EDGES .02 MAX. DO NOT SCALE DWG.	APPD	
MATERIAL	FINISH	

USE OF THIS PROPRIETARY INFORMATION IS RESTRICTED TO MAINTENANCE OF OUR PRODUCTS OR FABRICATION TO OUR ORDER.

NEWPORT LABORATORIES, INC.
630 E. YOUNG ST. SANTA ANA, CALIF. 92705

TITLE: EXCITATION WIRING FOR REAR PANEL (MICROVOLTMETER)

SIZE: A | NO.: 02169

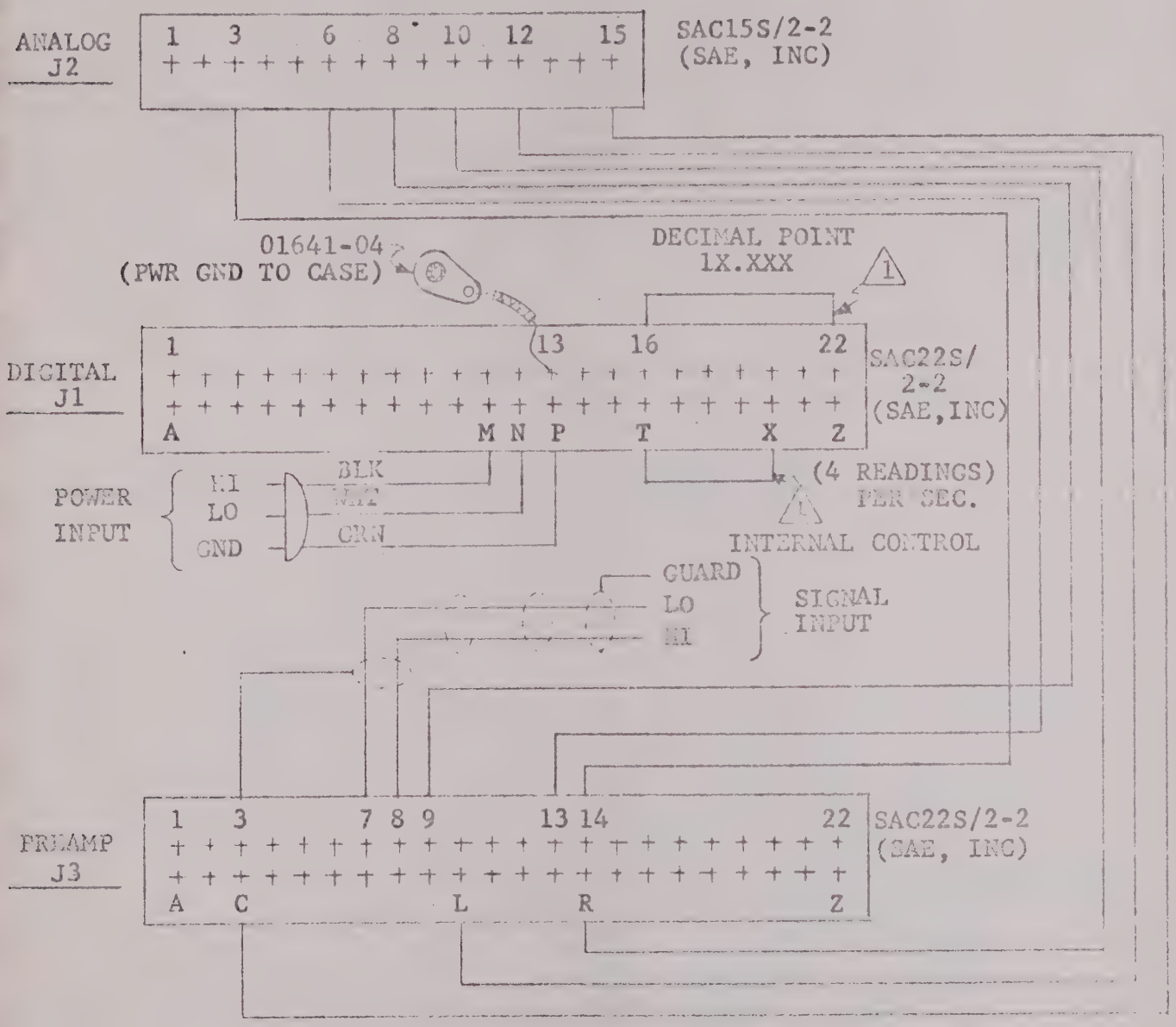
SCALE | MODEL 2403 | SHEET 1 OF 1

5/69 DIETERICH-POST CLEARPRINT 1000H-10

CHG	L.O. NO.	DATES	BY	CHK

J1-13 - POWER GND TO CASE
J3-8 - PREAMP INPUT HI
J3-7 - PREAMP INPUT LO
J3-3 - GUARD (SHIELD)

DOUBLE SHIELDED CABLE



1 OPTIONAL WIRING. FOR REQUIREMENTS OTHER THAN SHOWN, REFER TO MANUAL.

UNLESS OTHERWISE SPECIFIED:	BY / DATE	NEWPORT LABORATORIES, INC. 630 E. YOUNG ST. SANTA ANA, CALIF. 92705
TOLERANCES .X ±.05 .XX ±.02 .XXX ±.005 ANGULAR ±0° 30' ✓	DR	TITLE CONNECTOR WIRING (BOTTOM MTG) MICROVOLTMETER
THREADS CLASS 2A OR 2B REMOVE BURRS AND SHARP EDGES .02 MAX. DO NOT SCALE DWG.	CHK	SIZE A NO. 02170-01
MATERIAL	APPD	SCALE MODEL 2400 SHEET 1 OF 1
	FINISH	

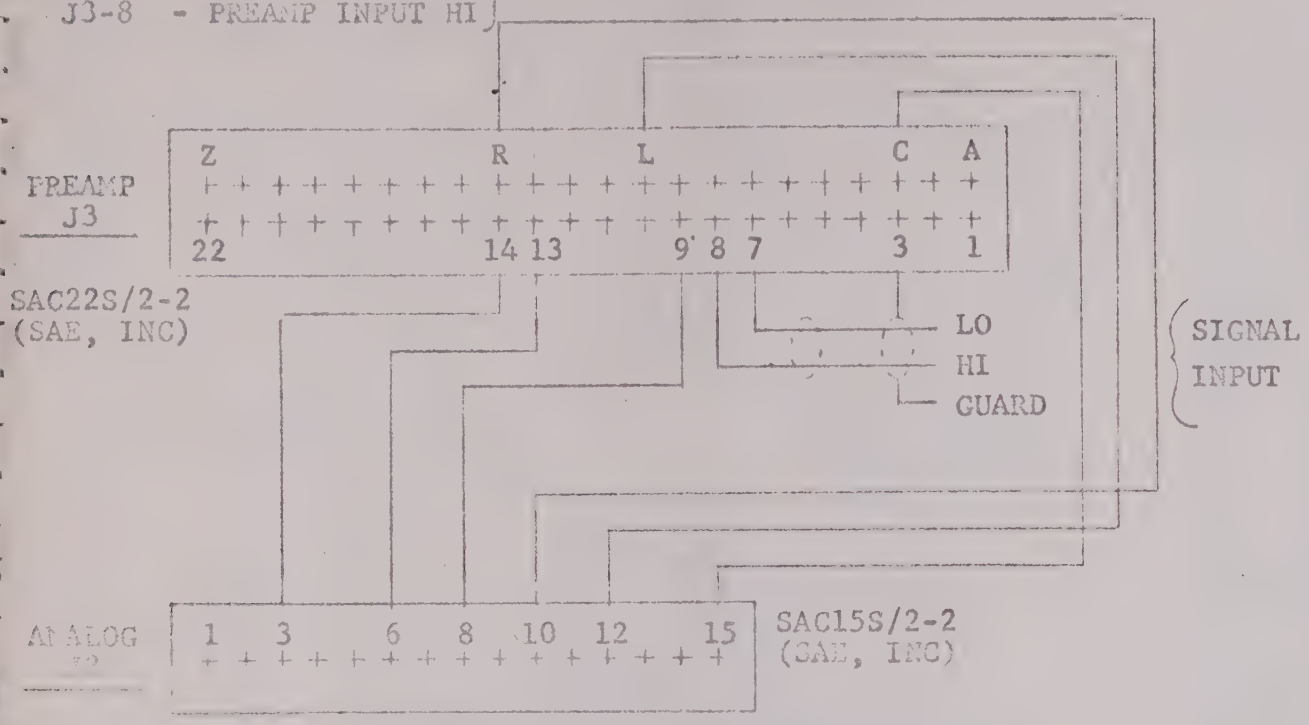
USE OF THIS PRORIETARY INFORMATION IS RESTRICTED TO MAINTENANCE OF OUR PRODUCTS OR FABRICATION TO OUR ORDER.

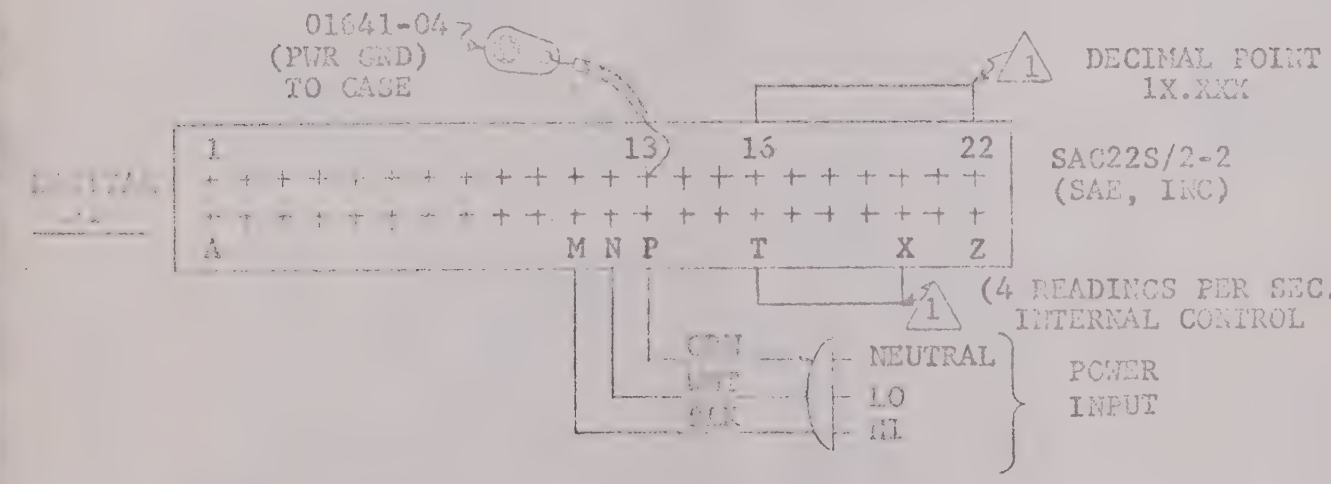
5/69 DIETERICH-POST CLEARPRINT 1000H-10

CHG	E.O. NO.	DATES	BY	CHK

J1-13 - POWER GND TO CASE
J3-3 - GUARD (SHIELD)
J3-7 - PREAMP INPUT LO
J3-8 - PREAMP INPUT HI

DOUBLE SHIELDED CABLE



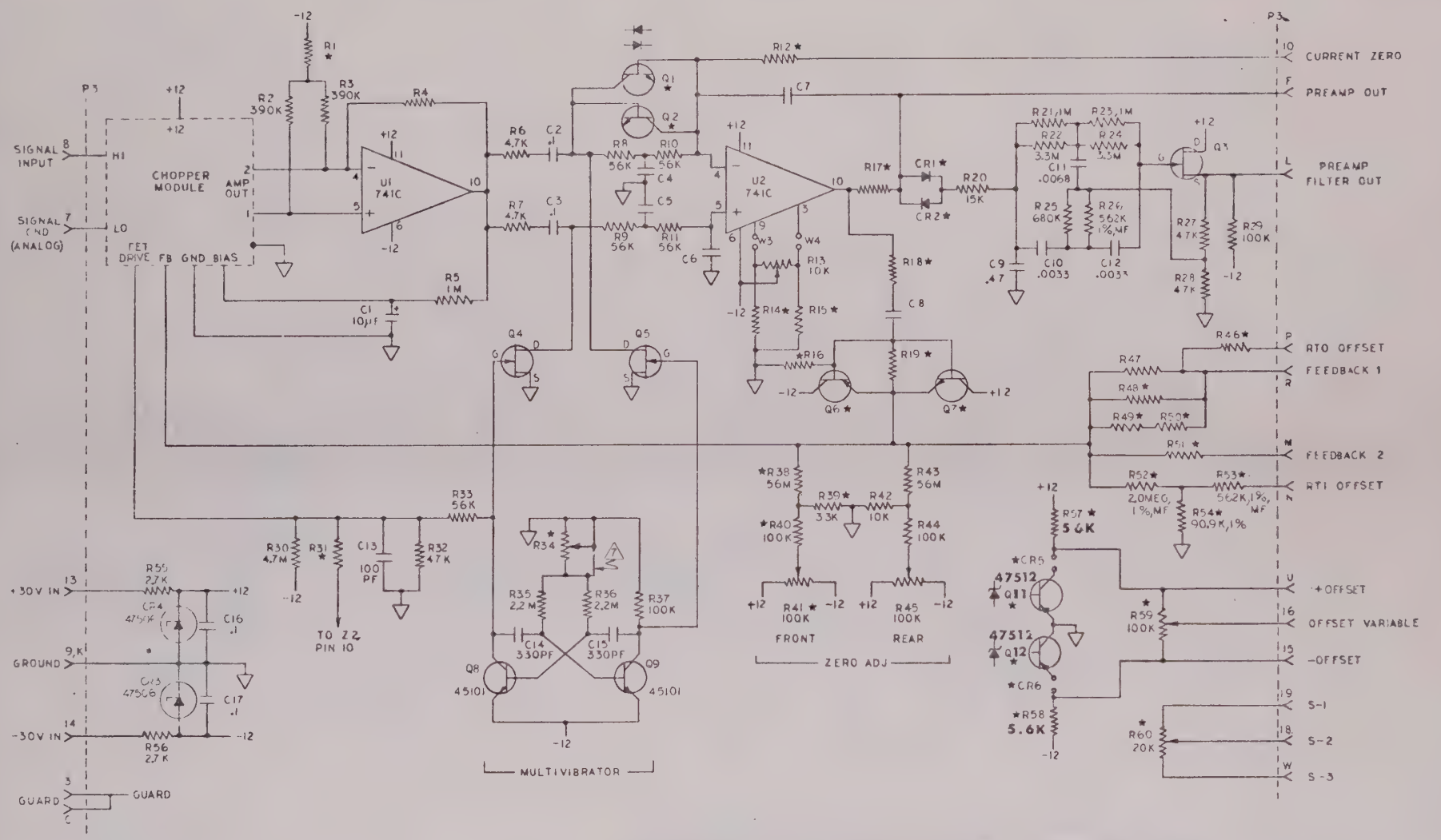


1 OPTIONAL WIRING. FOR REQUIREMENTS OTHER THAN SHOWN, REFER TO MANUAL.

UNLESS OTHERWISE SPECIFIED:	BY / DATE	NEWPORT LABORATORIES, INC. 630 E. YOUNG ST. SANTA ANA, CALIF. 92705
TOLERANCES .X ±.05 .XX ±.02 .XXX ±.005 ANGULAR ±0°30' ✓	DR / CHK / APPD	TITLE: CONNECTOR WIRING (TOP MTG) MICROVOLTMETER
THREADS CLASS 2A OR 2B REMOVE BURRS AND SHARP EDGES .02 MAX. DO NOT SCALE DWG.	USE OF THIS PROPRIETARY INFORMATION IS RESTRICTED TO MAINTENANCE OF OUR PRODUCTS OR FABRICATION TO OUR ORDER.	SIZE A — NO. 02170-[illegible]
MATERIAL	FINISH	SCALE

5-69 DIETERICH-POST CLEARPRINT 1000H-10

CHG	E.O NO.	DATES	BY	CHK
A	321	5-4-71	[illegible]	J.G
B	389	11-8-71	[illegible]	J.G



FS1	02117
TS1	02118
TS2	02119
TS3	02120
AF6	02089-01
AF7	02089-02
AF8	02089-03

9. FOR P/L SEE 02073-02.
8. P1 IS DIGITAL CARD CONN; P2 IS ANALOG CARD CONN.
7. WHEN R34 IS USED, CIRCUIT LINE IS CUT ON BOARD.
6. ★ REPRESENTS PARTS NOT PRESENT ON ALL UNITS.
5. SEE D/I IN OPTION TABLE FOR VALUES NOT SHOWN.
4. DIODES ARE 47000
3. FETS ARE 47602
2. ALL CAPACITANCE VALUES IN UF
1. ALL RESISTANCE VALUES IN OHMS & ARE ±10%, ½W.

NOTES: UNLESS OTHERWISE SPECIFIED

LAST NUMBER USED		
C36		T1
CR21	Q26	
W5	R88	U3

NUMBERS OMITTED

UNLESS OTHERWISE SPECIFIED:

TOLERANCES
.X ±.05 | ANGULAR ±0° 30'
.XX ±.02 | ✓
.XXX ±.005
THREAD CLASS 2A OR 2B
REMOVE BURRS AND SHARP EDGES .02 MAX.
DO NOT SCALE DWG

MATERIAL

FINISH

	BY	DATE
DR	[illegible]	9/30/70
CHK	[illegible]	
APPD	[illegible]	10/1/70

USE OF THIS PROPRIETARY INFORMATION IS RESTRICTED TO MAINTENANCE OF OUR PRODUCTS OR FABRICATION TO OUR ORDER.

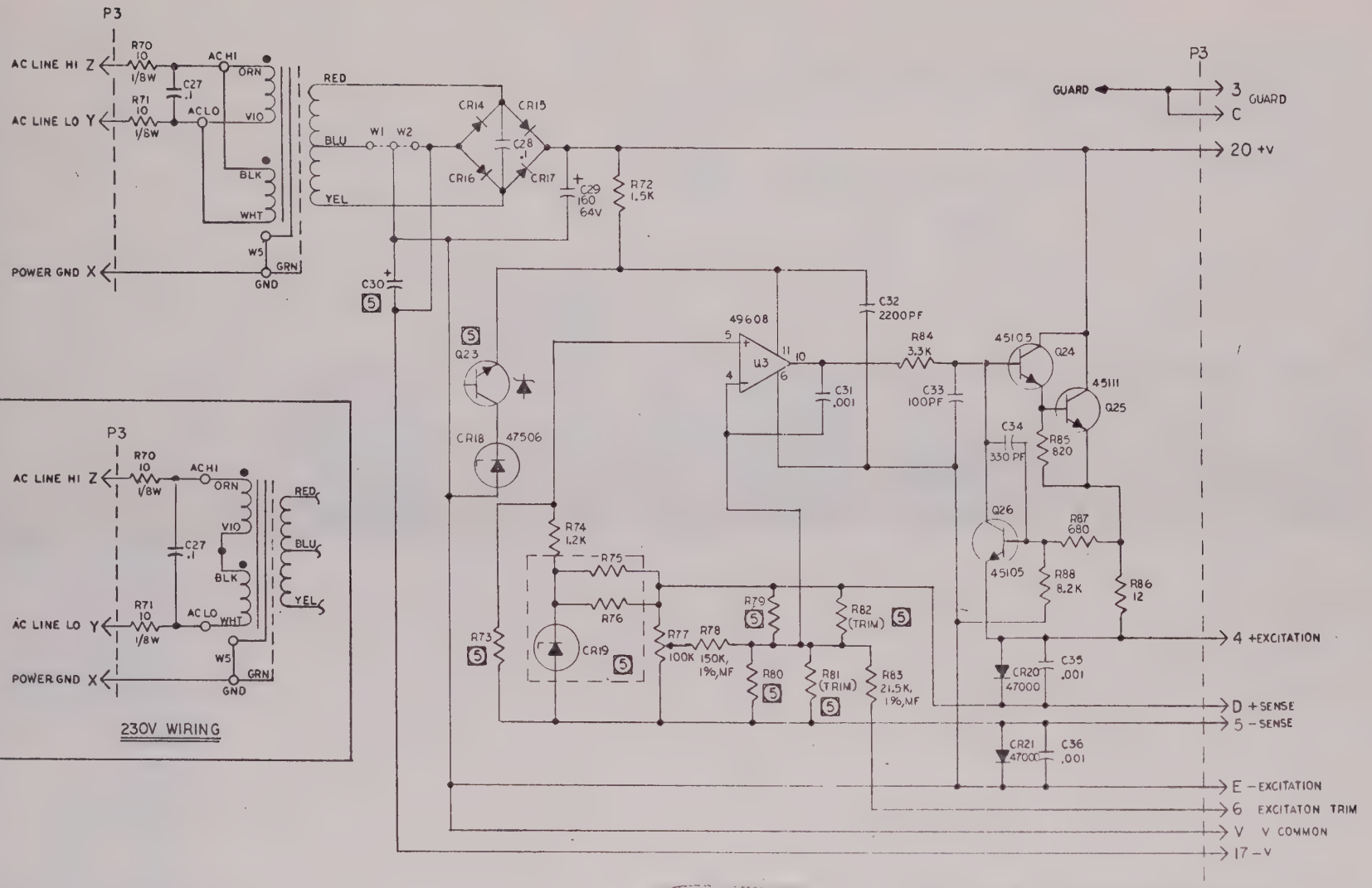
NEWPORT LABORATORIES, INC.
630 E. YOUNG ST. SANTA ANA, CALIF. 92705

TITLE SCHEMATIC DIAGRAM PREAMPLIFIER

SIZE C | NO. 02067-01

SCALE ——— | MODEL 2400 | SHEET 1 OF 1

CHG	E.O NO.	DATES	BY	CHK
A	RE-ISSUE	1-13-75	DH	J.O.



7 REF INSTALLATION DWG. 05746.
6. REF ASSY. DIAGRAM 02066.
5 INDICATES PARTS THAT VARY WITH OPTION.
4. FOR PARTS LIST SEE 02113-02 (OPT TS1) 02119-02 (OPT. TS2)
3. DIODES ARE 47000.
2. ALL CAPACITORS VALUES IN MICROFARADS.
1. ALL RESISTOR VALUES IN OHMS, 1/2W, ±10%.
NOTES: UNLESS OTHERWISE SPECIFIED.

LAST NO. USED	
C36	P3 T1
CR21	Q26
	R88 U3
W5	
NUMBERS OMITTED	

UNLESS OTHERWISE SPECIFIED:

TOLERANCES
X ±.05 ANGULAR ±0°30'
XX ±.02 ✓
XXX ±.005
THREAD CLASS 2A OR 2B
REMOVE BURRS AND SHARP EDGES .02 MAX.
DO NOT SCALE DWG

MATERIAL

FINISH

	BY	DATE
DR		9-15-70
CHK		
APPD		10-16-70

USE OF THIS PROPRIETARY INFORMATION IS RESTRICTED TO MAINTENANCE OF OUR PRODUCTS OR FABRICATION TO OUR ORDER.

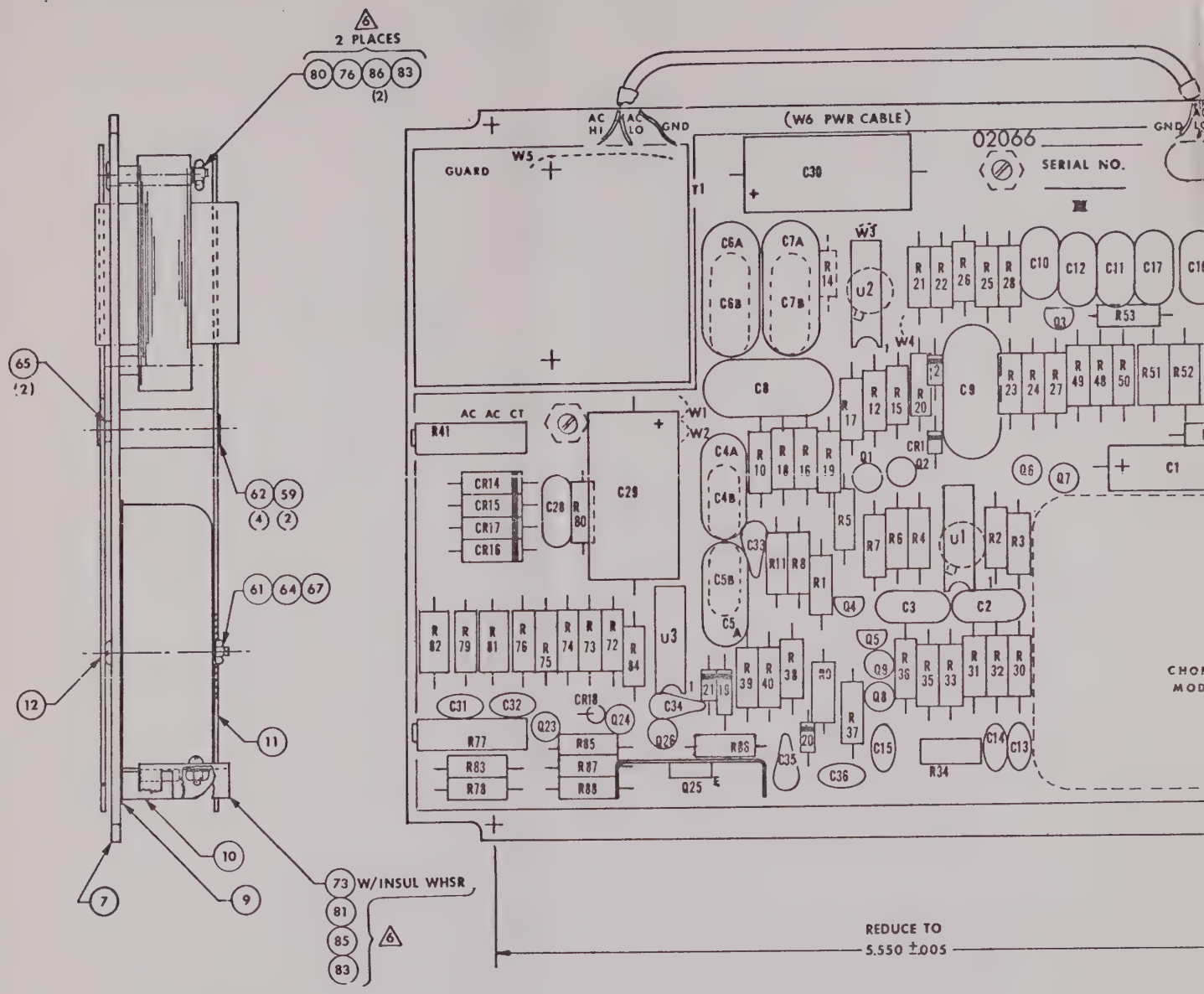
NEWPORT LABORATORIES, INC.
630 E. YOUNG ST. SANTA ANA, CALIF. 92705

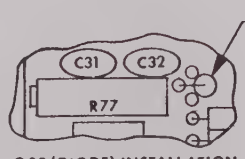
TITLE SCHEMATIC DIAGRAM, EXCITATION POWER SUPPLY— OPTIONS TS1 AND TS2

SIZE C | NO. 02067-02

SCALE ——— | MODEL 2400A, A9 | SHEET 1 OF 1

5/69 DIETERICH-POST CLEARPRINT 1000H





Q23 (DIODE) INSTALLATION

DETAIL A

⚠ FOR 230V WIRING SEE 05746

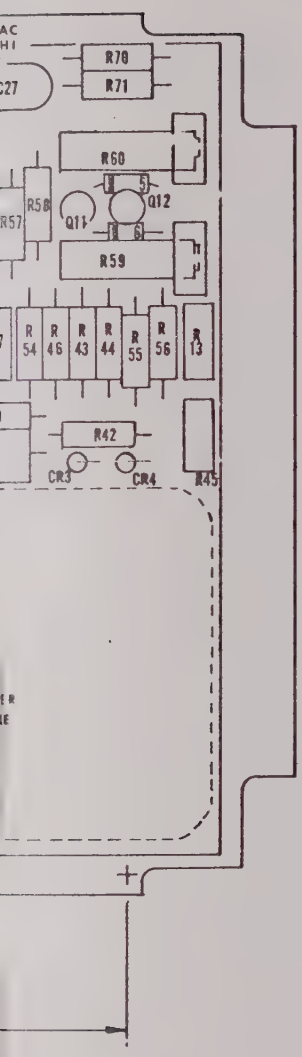
⑥ SEE P/L 02118-02 (OPT TS1) OR 02119-02 (OPT TS2)

5. STENCIL PART NO & SERIAL NO. WITH .12 CHARACTERS
4. ASSEMBLE & SOLDER PER NEWPORT STANDARDS
3. PART LIST NO 04811-01
2. SCHEMATIC DIAGRAM NO. 02067-04
1. TEST PER SPECIFICATION NO 02064

NOTES: UNLESS OTHERWISE SPECIFIED.

DIETERICH-POST CLEARPRINT 3000H

CHG	E.O. NO.	DATES	BY	C..
A	RELEASE	10-5-70	ELG	AM
B	221	10-17-70	ELG	RM
C	1185	10-25-74	D.H.	JO



TRANSFORMER WIRING	
AC	YEL OR RED
AC	RED OR YEL
CT	BLUE
AC HI	BLK & ORN
AC LO	WHT & VIO
GND	GREEN

7

.125
.031
CR3,4 18 & Q23

UNLESS OTHERWISE SPECIFIED:	BY	DATE
	DR [illegible]	8-25-70
	CHK [illegible]	10/2/70
	APPD [illegible]	10/2/70

TOLERANCES
.X ± .05 | ANGULAR ± 0° 30'
.XX ± .02 | ✓
.XXX ± .005
THREAD CLASS 2A OR 2B
REMOVE BURRS AND SHARP EDGES .02 MAX.
DO NOT SCALE DWG

USE OF THIS PROPRIETARY INFORMATION IS RESTRICTED TO MAINTENANCE OF OUR PRODUCTS OR FABRICATION TO OUR ORDER.

MATERIAL _____ FINISH _____

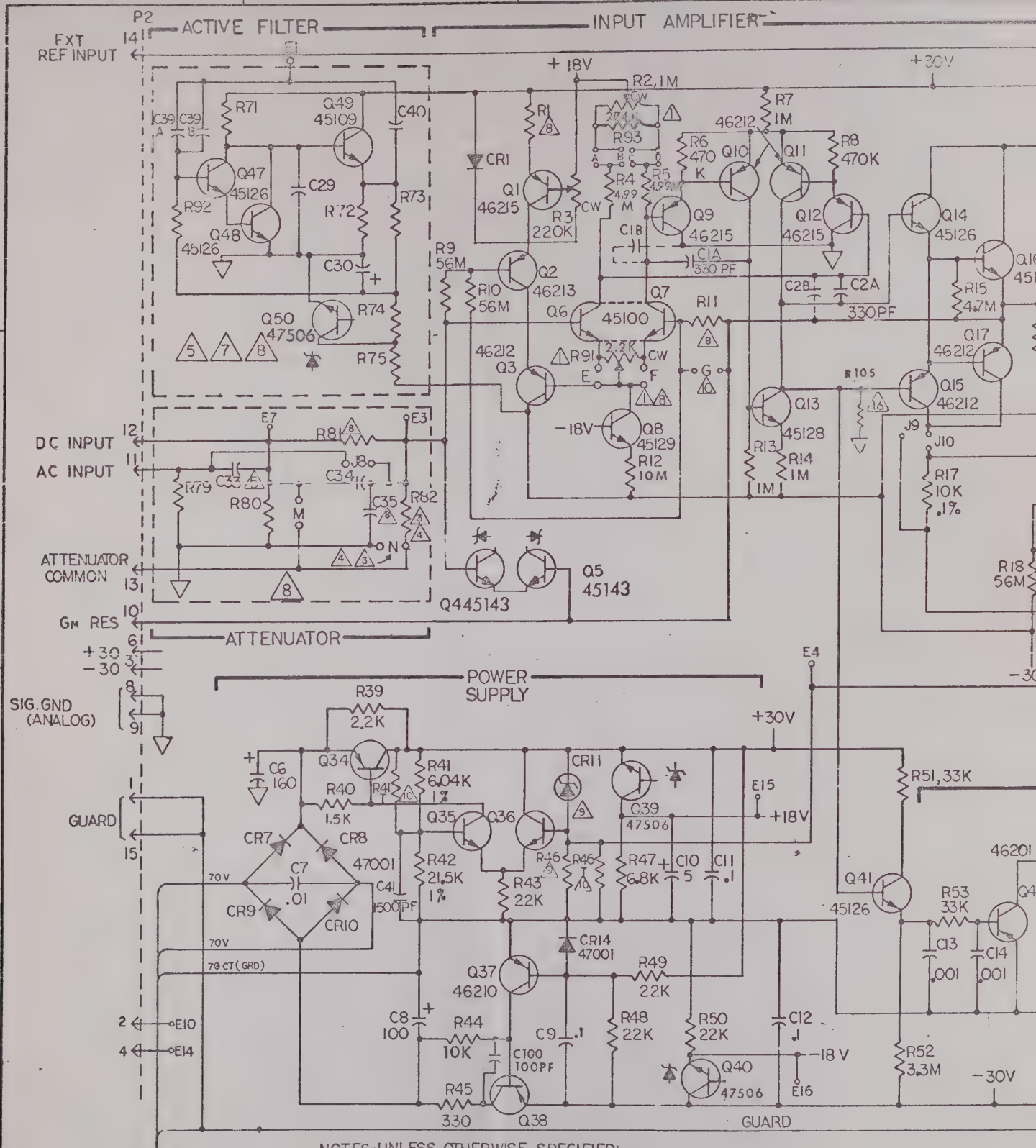
NEWPORT LABORATORIES, INC.
630 E. YOUNG ST. SANTA ANA, CALIF. 92705

TITLE ASSY DIAGRAM — PREAMPLIFIER

SIZE D | NO. 02066

SCALE 2:1 | MODEL 2400A/S | SHEET OF 1

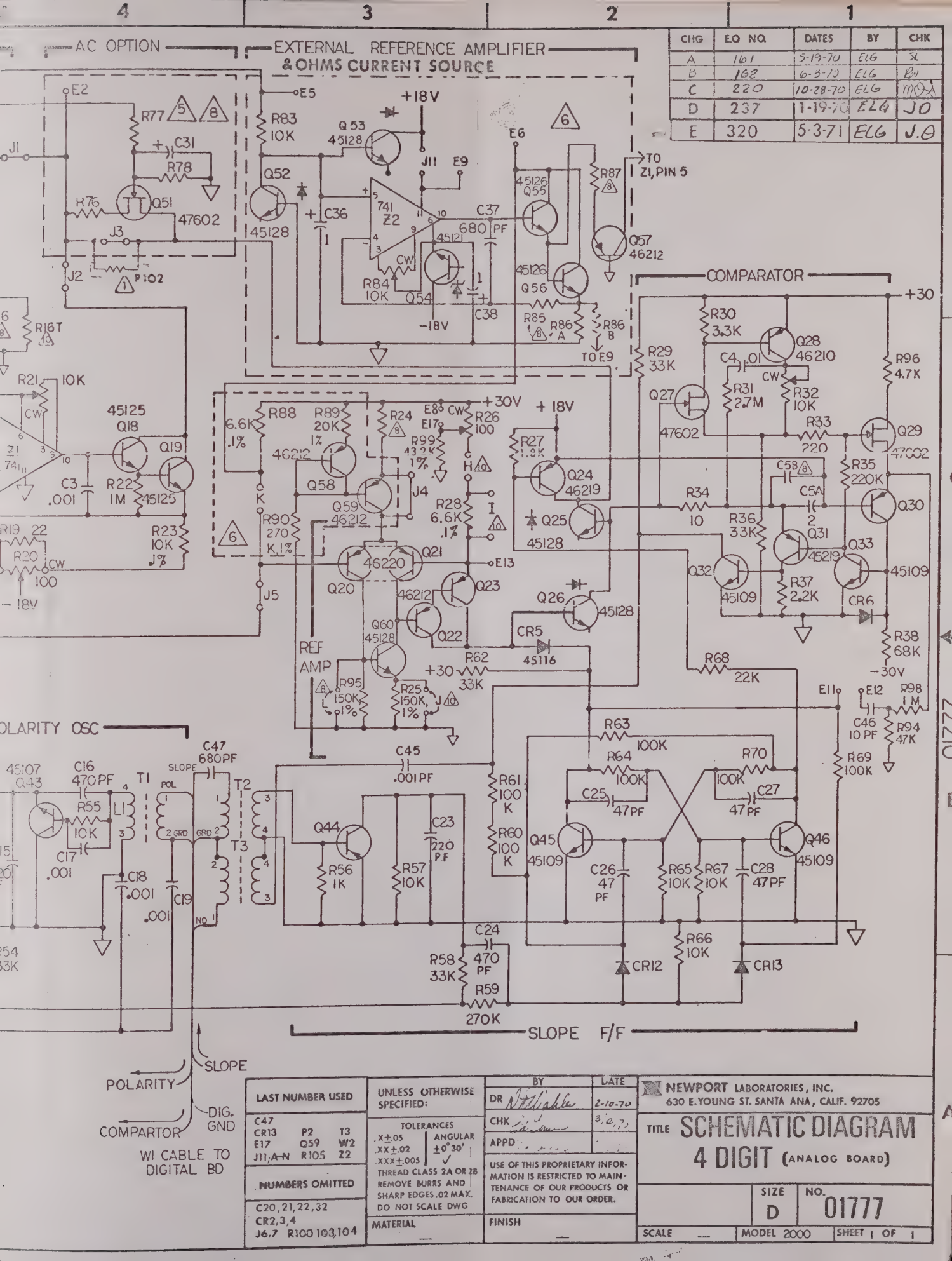
02066



NOTES-UNLESS OTHERWISE SPECIFIED:

1. USED WITH 200 mV.
2. 2V.
3. 20V.
4. 200V.
5. AC.
6. RATIO.
7. USED WITH ACTIVE FILTER.
8. SEE PARTS LIST FOR VALUES.
9. ZENER REF KIT 01872.
10. USED FOR FACTORY SELECT TRIM.
11. ALL CAPACITANCE VALUES IN UF.
12. ALL RESISTANCE VALUES IN OHMS.
13. DIODES ARE 47000.
14. ALL PNP TRANSISTORS ARE 46205.
15. ALL NPN TRANSISTORS ARE 45105.
16. USED ON MODEL 2400

GUARD — 70 CT
70V
70V
W2 CABLE TO DIGITAL BD



CHG	E.O NO.	DATES	BY	CHK
A	161	5-19-70	ELG	SL
B	162	6-3-70	ELG	RN
C	220	10-28-70	ELG	MOA
D	237	1-19-71	ELG	JO
E	320	5-3-71	ELG	J.O

LAST NUMBER USED			
C47			
CR13	P2	T3	
E17	Q59	W2	
J11; A-N	R105	Z2	

NUMBERS OMITTED
C20, 21, 22, 32
CR2, 3, 4
J6, 7 R100 103, 104

UNLESS OTHERWISE SPECIFIED:

TOLERANCES
.X ±.05
.XX ±.02
.XXX ±.005
ANGULAR ±0° 30'
THREAD CLASS 2A OR 2B
REMOVE BURRS AND SHARP EDGES .02 MAX.
DO NOT SCALE DWG

MATERIAL —

	BY	DATE
DR		2-10-70
CHK		3/9/70
APPD		

USE OF THIS PROPRIETARY INFORMATION IS RESTRICTED TO MAINTENANCE OF OUR PRODUCTS OR FABRICATION TO OUR ORDER.

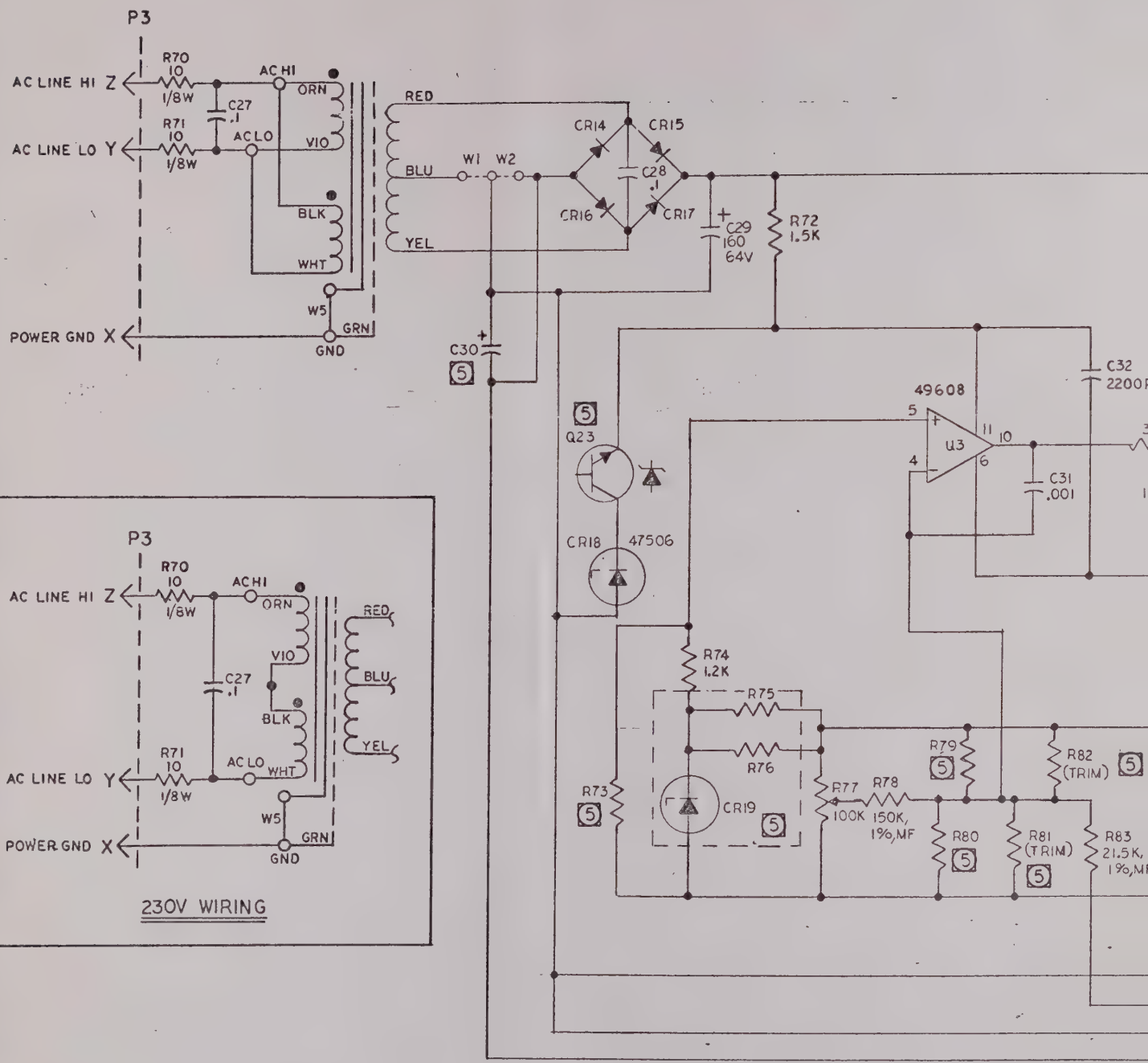
FINISH —

NEWPORT LABORATORIES, INC.
630 E. YOUNG ST. SANTA ANA, CALIF. 92705

TITLE SCHEMATIC DIAGRAM
4 DIGIT (ANALOG BOARD)

SIZE D | NO. 01777

SCALE — | MODEL 2000 | SHEET 1 OF 1



230V WIRING

7. REF INSTALLATION DWG. 05746.
6. REF ASSY. DIAGRAM 02066.
5. INDICATES PARTS THAT VARY WITH OPTION.
4. FOR PARTS LIST SEE 02118-02 (OPT TS1) 02119-02 (OPT. TS2)
3. DIODES ARE 47000.
2. ALL CAPACITORS VALUES IN MICROFARADS.
1. ALL RESISTOR VALUES IN OHMS, 1/2W, ±10%.

NOTES: UNLESS OTHERWISE SPECIFIED.

LAST NO. USED		
C36	P3	T1
CR21	Q26	
	R88	U3
W5		
NUMBERS OMITTED		

UNLESS OTHERWISE SPECIFIED:

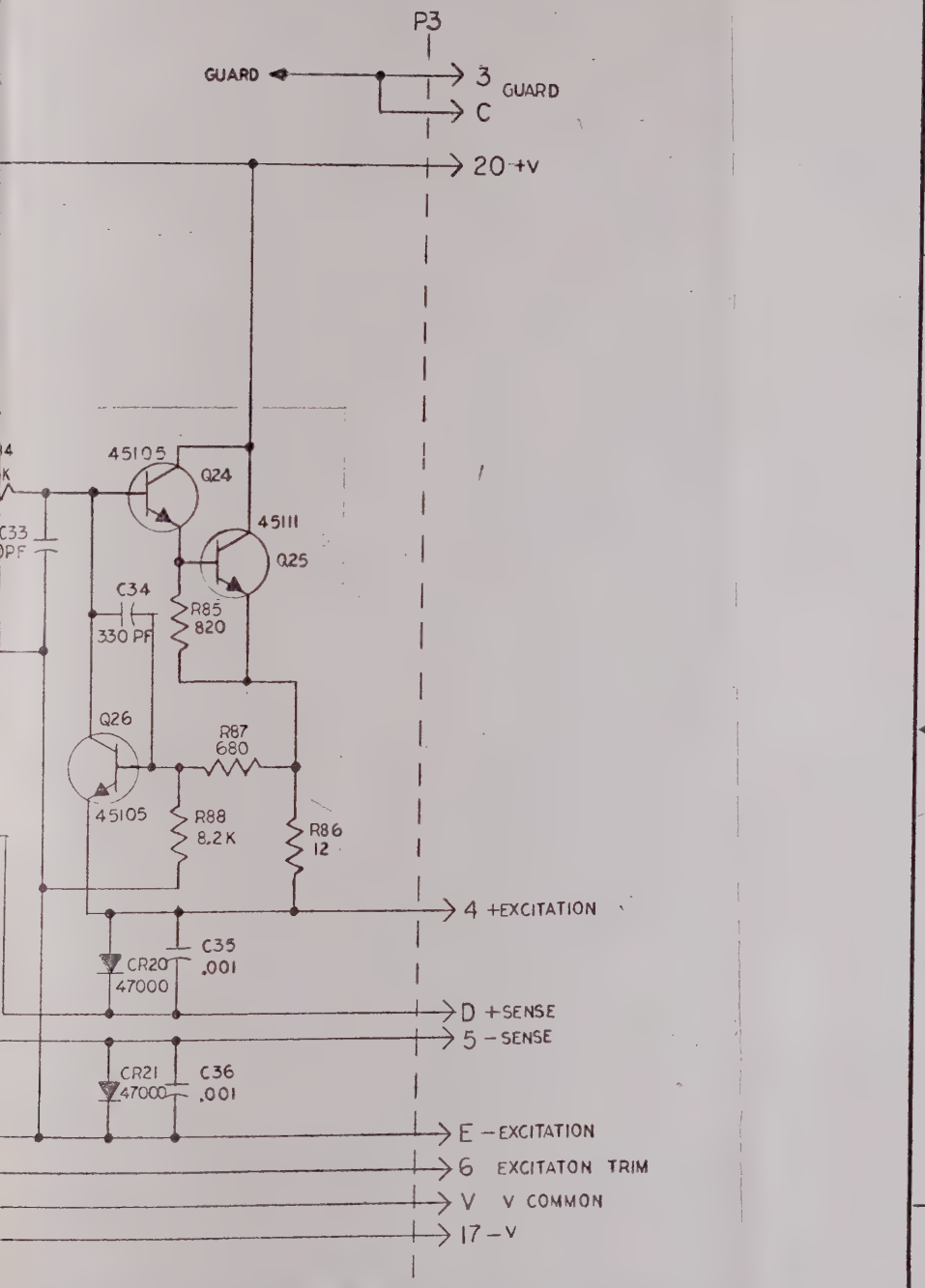
TOLERANCES	
X ±.05	ANGULAR ±0° 30'
XX ±.02	✓
XXX ±.005	

THREAD CLASS 2A O
REMOVE BURRS AND
- SHARP EDGES .02 MA
DO NOT SCALE DW

MATERIAL

1 02067 02

CHG	E.O NO.	DATES	BY	CHK
A	RE-ISSUE	1-13-75	DH	J.O.



	BY	DATE
DR		10-1-70
CHK		
APPD		10-1-70

USE OF THIS PROPRIETARY INFORMATION IS RESTRICTED TO MAINTENANCE OF OUR PRODUCTS OR FABRICATION TO OUR ORDER.

FINISH

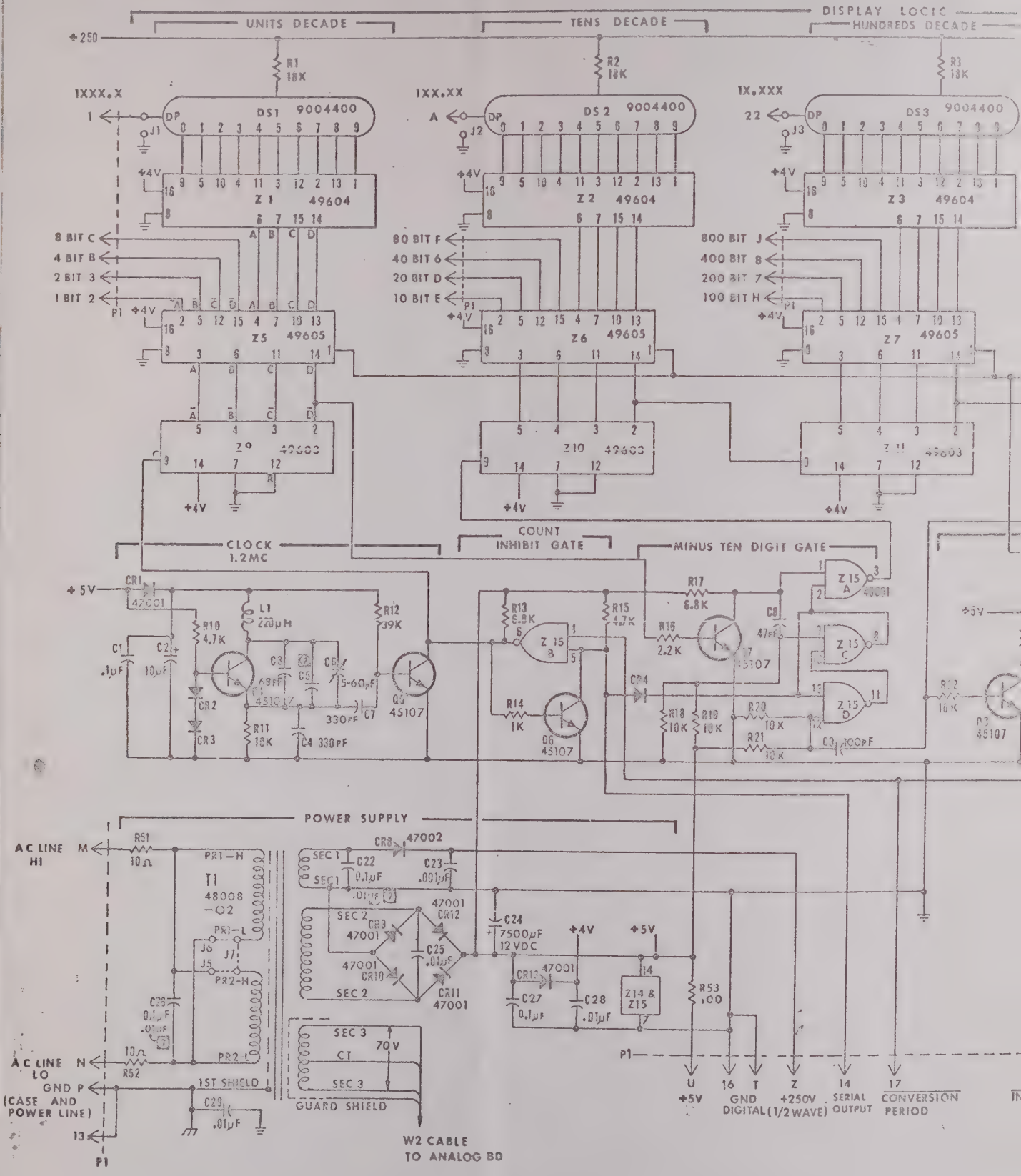
NEWPORT LABORATORIES, INC.
630 E. YOUNG ST. SANTA ANA, CALIF. 92705

TITLE SCHEMATIC DIAGRAM, EXCITATION POWER SUPPLY- OPTIONS TS1 AND TS2

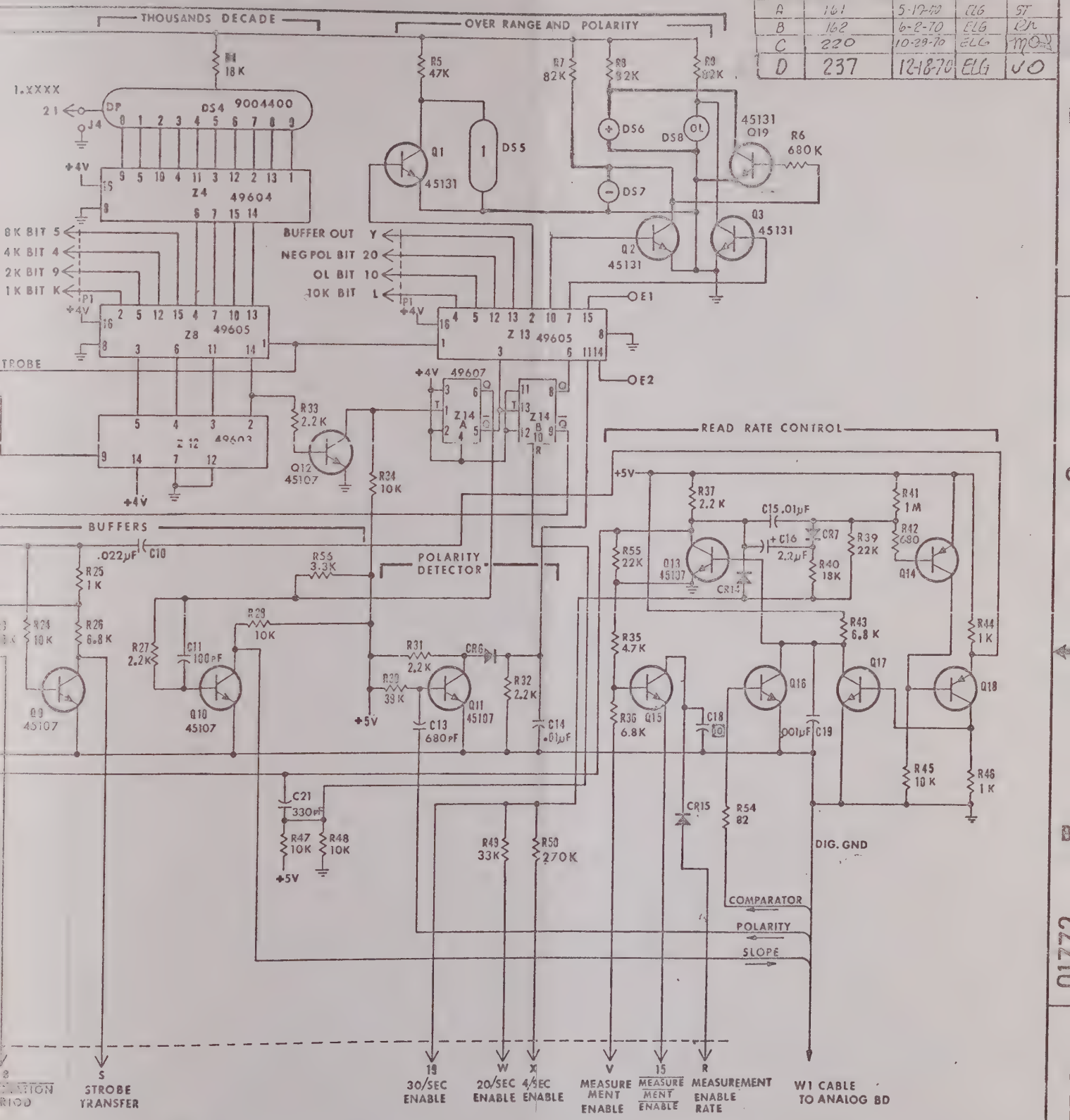
SIZE	NO.
C	02067-02

SCALE —— MODEL 2400A, AS SHEET 1 OF 1

40


DISPLAY LOGIC
UNITS DECADE
TENS DECADE
HUNDREDS DECADE
+250
R1 18K
R2 18K
R3 18K
1XXX.X
1XX.XX
1X.XXX
DS1 9004400
DS2 9004400
DS3 9004400
Z1 49604
Z2 49604
Z3 49604
8 BIT C
4 BIT B
2 BIT 3
1 BIT 2
80 BIT F
40 BIT 6
20 BIT D
10 BIT E
800 BIT J
400 BIT 8
200 BIT 7
100 BIT H
Z5 49605
Z6 49605
Z7 49605
Z9 49603
Z10 49603
Z11 49603
+4V
CLOCK
1.2MC
COUNT
INHIBIT GATE
MINUS TEN DIGIT GATE
+5V
CR1 47001
L1 220µH
R12 39K
R10 4.7K
C1 .1µF
C2 10µF
C3 68PF
C5
C6 5-60PF
330PF C7
Q5 45107
CR2
CR3
R11 18K
C4 330PF
R13 6.8K
R15 4.7K
R17 6.8K
R16 2.2K
Q7 45107
C8 47PF
Z15 A
Z15 B
Z15 C
Z15 D
CR4
R14 1K
Q6 45107
R18 10K
R19 10K
R20 10K
R21 10K
C9 100PF
R22 10K
Q3 45107
POWER SUPPLY
AC LINE HI
M
R51 10Ω
PRI-H
T1 48008-02
PRI-L
PR2-H
PR2-L
J6
J7
J5
C26 0.1µF .01µF
AC LINE LO
N
R52 10Ω
GND P
(CASE AND POWER LINE)
1ST SHIELD
C29 .01µF
13
P1
SEC 1
SEC 2
SEC 3
CT
70V
C22 0.1µF
.01µF
C23 .001µF
CR8 47002
CR9 47001
CR10 47001
CR11 47001
CR12 47001
C24 7500µF 12 VDC
C25 .01µF
C27 0.1µF
C28 .01µF
Z14 & Z15
R53 100
GUARD SHIELD
W2 CABLE TO ANALOG BD
U +5V
16 GND DIGITAL
T
Z +250V (1/2 WAVE)
14 SERIAL OUTPUT
17 CONVERSION PERIOD

CHG	E.O. NO.	DATES	BY	CHK
A	161	5-17-70	ELG	ST
B	162	6-2-70	ELG	RM
C	220	10-29-70	ELG	MO
D	237	12-18-70	ELG	JO



10 SELECT IN TEST.
9 USED FOR 400Hz LINE ONLY.
8 RESISTANCE VALUES IN OHMS.
7 USED FOR 50Hz LINE ONLY.
6. FOR PART LIST SEE 01794.
5
4. DIODES ARE 47000.
3. RESISTORS ARE 1/2W, 10%.
2. ALL PNP TRANSISTORS ARE 46205.
1. ALL NPN TRANSISTORS ARE 45105.
NOTES: UNLESS OTHERWISE SPECIFIED

LAST NUMBER USED		
C29	L1	S
CR15	P1	T1
DS7	Q19	V
J7	R56	Z15

NUMBERS OMITTED
R29,38 C12,17,20 CR5

	BY	DATE
DR	W BARRETT	2/12/70
CHK		2/12/70
APPD		3/12/70

USE OF THIS PROPRIETARY INFORMATION IS RESTRICTED TO MAINTENANCE OF OUR PRODUCTS OR FABRICATION TO OUR ORDER.

FINISH

NEWPORT LABORATORIES, INC.
630 E. YOUNG ST. SANTA ANA, CALIF. 92703

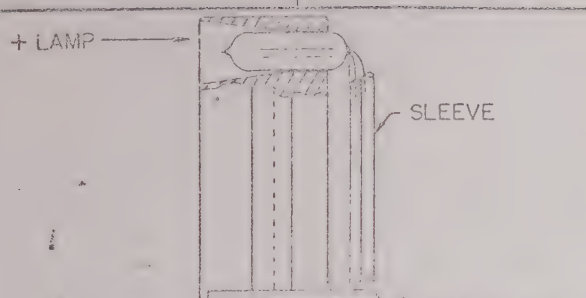
TITLE SCHEMATIC DIAGRAM
4 DIGIT (DIGITAL BOARD)

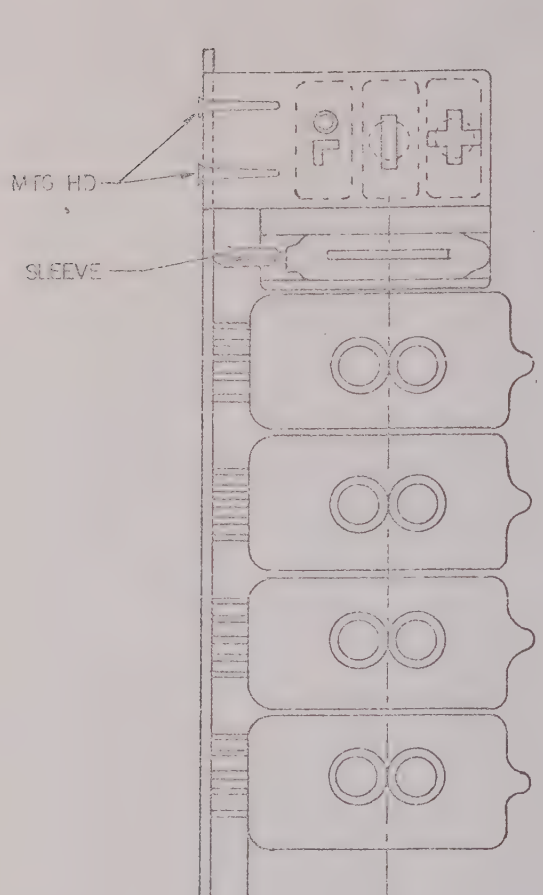
SIZE D | NO. 01772

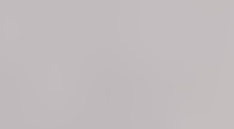
SCALE | MODEL 2000 | SHEET 1 OF 1

01772

8 | 7 | 6 | 5

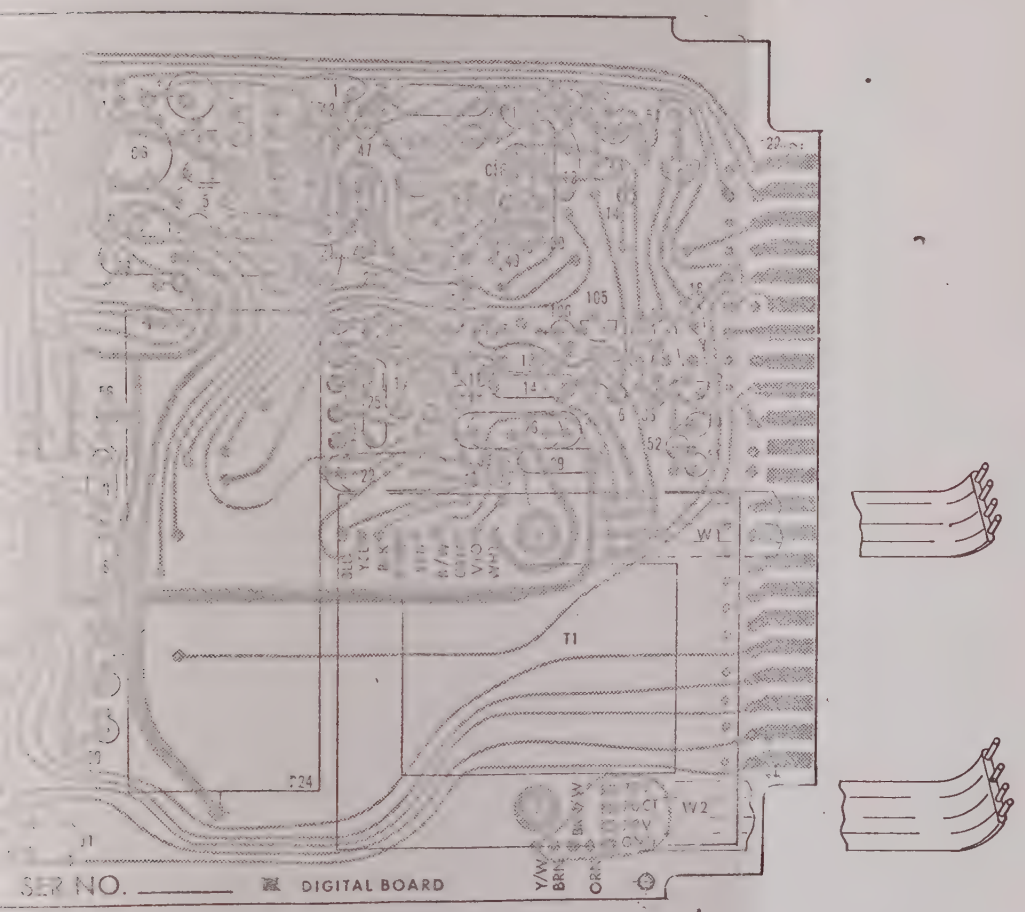






5 STENCIL - - - - - - - SERIAL NO
4 ASSEMBLE & SOLDER PER NEWP
3 PART LIST NO 01794 (BASIC)
2 SCHEMATIC DIAGRAM NO 01
1 TEST PER SPECIFICATION NO 0
NOTES UNLESS OTHERWISE SPE

CHG	E.O NO.	DATES	BY	CHK
A	162	6-3-70	ELS	[illegible]
B	220	3 NOV 70	MOS	[illegible]
C	237	12-18-70	[illegible]	JO
D	287	3-22-71	EG	JO



SYMBOL	REPRESENTS
	CR-DIODE
	R - RESISTOR
	Q-TRANSISTOR
	C-CAPACITOR

LAST NO. USED

C29 P1 T1
CR15 Q19 W2
DS5 R56 Z15
J7

NUMBERS OMITTED

R29.38
C12,17.20
CR5

UNLESS OTHERWISE SPECIFIED:

TOLERANCES
.X ± .05 | ANGULAR ± 0° 30'
.XX ± .02
.XXX ± .005 ✓
THREAD CLASS 2A OR 2B
REMOVE BURRS AND SHARP EDGES .02 MAX.
DO NOT SCALE DWG

MATERIAL

FINISH

	BY	DATE
DR	[illegible]	2/11/70
CHK	[illegible]	2/20/70
APPD		

USE OF THIS PROPRIETARY INFORMATION IS RESTRICTED TO MAINTENANCE OF OUR PRODUCTS OR FABRICATION TO OUR ORDER.

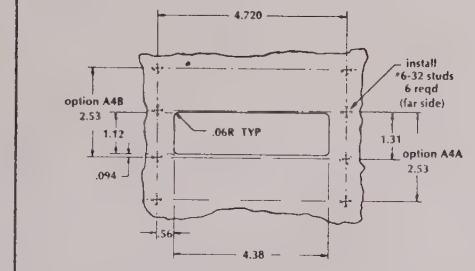
NEWPORT LABORATORIES, INC.
630 E. YOUNG ST. SANTA ANA, CALIF. 92705

TITLE ASSEMBLY DIAGRAM
4 DIGIT DIGITAL

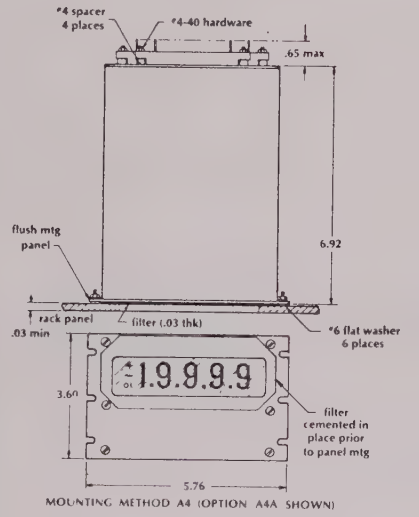
SIZE D | NO. 01771

SCALE 2/1 | MODEL 2000 | SHEET 1 OF 1

H.12 CHARARTERS
STANDARDS

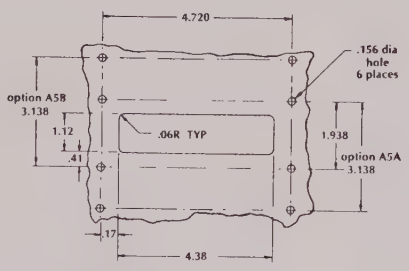


RECOMMENDED PANEL CUTOUT

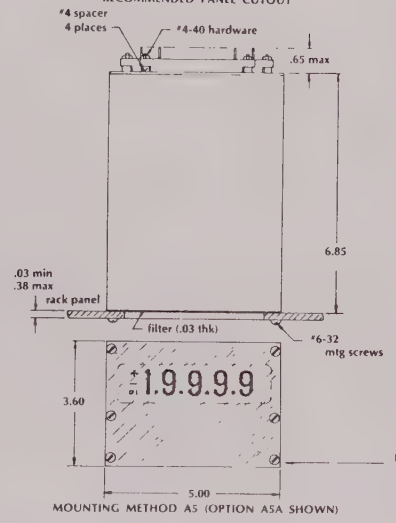


MOUNTING METHOD A4 (OPTION A4A SHOWN)

Mounting Method A4A and A4B
For flush mounting on studs behind the rack panel.

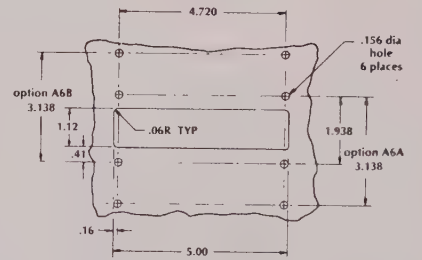


RECOMMENDED PANEL CUTOUT

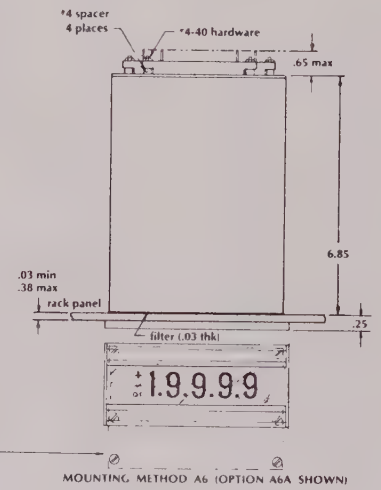


MOUNTING METHOD A5 (OPTION A5A SHOWN)

Mounting Method A5A and A5B
Unit is mounted on the rear by inserting six #6-32 self tapping screws through the rack panel to the case.



RECOMMENDED PANEL CUTOUT



MOUNTING METHOD A6 (OPTION A6A SHOWN)

Mounting Method A6A and A6B
Unit is mounted on the rear by inserting six #6-32 screws through the rack panel to the case. Bezel is assembled by removing the four center screws.

PANEL CUTOUT & CASE DIMENSIONS

NEWPORT LABORATORIES INC.
630 EAST YOUNG STREET • SANTA ANA, CALIFORNIA 92705
TELEPHONE (714) 540-4914 • TWX 910-595-1787

RETURNED MATERIAL AUTHORIZATION

NOTE: This completed form must accompany shipment.

Date _____

Date of original purchase _____/_____ (mo. / yr.) Original P.O. no. _____

Customer ship Prepaid to:

NEWPORT LABORATORIES, INC.
630 E. Young Street
Santa Ana, California 92705

Return to:

_____

_____

_____

Description of returned instrument

Model No. _____ Serial No. _____

Reason for return (specify malfunction in detail)

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____ _____
phone signature

Complete and exact malfunction information will expedite return of unit.